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UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 5
77 WEST JACKSON BOULEVARD
CHICAGO, IL 60604-3590

REPLY TO THE ATTENTION OF

April 9, 2001

Jeff Leed
Leed Environmental, Inc.
124 Deborah Drive
Reading, PA 19610

Dear Mr. Leed:

The U.S. Environmental Protection Agency has reviewed the September 2000 "Pre-Design Investigation Report for Groundwater" for the NL Industries/Taracorp Site in Granite City, Illinois and hereby approves this document as is.

Please contact me at (312) 886-4742 if you have any questions concerning this letter.

Sincerely,


Brad Bradley
Remedial Project Manager

cc: Sandy Bron, Illinois EPA

EPA Region 5 Records Ctr.



260518

Final Pre-Design Investigation Work Plan For Groundwater
NL Industries/Taracorp Superfund Site
Granite City, Illinois

ARCADIS Geraghty & Miller, Inc.
35 East Wacker Drive, Suite #1000
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REPORT

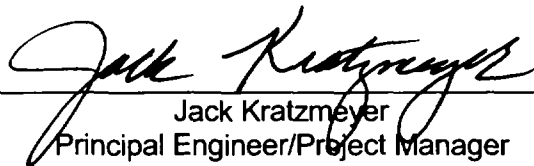
August 2000

**FINAL PRE-DESIGN INVESTIGATION WORK PLAN FOR GROUNDWATER
NL INDUSTRIES/TARACORP SUPERFUND SITE
GRANITE CITY, ILLINOIS**

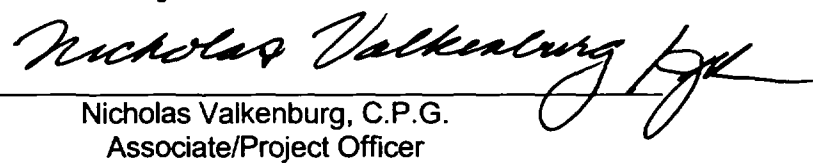
August 25, 2000

Prepared by **ARCADIS Geraghty & Miller, Inc.**

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- B. Quality Assurance Project Plan, Pre-Design Investigation, NL Industries/Taracorp Superfund Site, Granite City, Illinois.
- C. Health & Safety Plan, Pre-Design Investigation, NL Industries/Taracorp Superfund Site, Granite City, Illinois.
- D. U.S. EPA Comments on the September 1999 Draft Pre-Design Investigation Work Plan for Groundwater, NL Industries/Taracorp Superfund Site, Granite City, Illinois.

1.0 Introduction

This Pre-Design Investigation Work Plan for Groundwater has been prepared to describe the pre-design groundwater sampling and associated studies to be performed by the NL Industries/Taracorp Superfund Site Group (the Group) towards completion of its remedial design obligations for the groundwater remedy at the NL Industries/Taracorp Superfund Site (the Site) under the terms and conditions of the Consent Decree, the Statement of Work for Remedial Design, the March 30, 1990 Record of Decision (ROD), and the September 29, 1995 Decision Document/Explanation of Significant Differences (EE/ESD).

1.1 Purpose of the Pre-Design Investigation

The purpose of the Pre-Design Investigation is to update the existing groundwater quality data for the Site, as well as determine selected soil and aquifer characteristics. As part of the Pre-Design Investigation, the existing site monitoring wells will be redeveloped and selected monitoring wells will be replaced, as necessary. Some wells will also be added to expand the existing monitoring well network at the Main Industrial Site, and to evaluate the presence of any impacts to shallow groundwater in the Remote Fill Areas (Eagle Park and Venice Township). Monitoring well installation, groundwater sampling and analysis, in situ hydraulic conductivity testing, and collection and analysis of soil samples are included in the scope of work for the Pre-Design Investigation.

1.2 Organization of the Work Plan

This Pre-Design Investigation Work Plan is organized into five sections of text, plus references, tables, figures, and appendices. A brief description of each section follows:

Section 2.0, Background, describes the Site conditions, presents information on the history of the Site, and presents the results of prior investigations.

Section 3.0, Description of Pre-Design Investigations, describes the specific sampling activities and associated studies that will be performed as part of the Pre-Design Field Investigation.

Section 4.0, Project Organization and Responsibility, identifies the key personnel assigned to the project team for the Pre-Design Investigation and describes their project responsibilities.

Section 5.0, Remedial Design Schedule, presents the schedule for completion of the remedial design activities, as presented in the U.S. EPA Statement of Work for Remedial Design and Remedial Action at the NL Industries/Taracorp Superfund Site. A detailed Gantt chart schedule, which identifies the major project tasks and associated timelines, is provided.

Appendices, Supplemental project plans including a Field Sampling Plan (Appendix A), a Quality Assurance Project Plan (Appendix B) and a Health and Safety Plan (Appendix C) are also provided as appendices to the Pre-Design Investigation Work Plan, as well as U.S. EPA's comments on the Draft Pre-Design Investigation Work Plan (Appendix D).

2.0 Background

2.1 Site History

The NL Industries/Taracorp Superfund Site (the Site) is the location of a former lead-acid battery breaking and secondary lead smelting facility in Granite City, Illinois (see Figure 1). Metal refining, fabricating, and associated activities have been conducted at the Site since before the turn of the century with secondary lead smelting conducted since 1903. The Site is located almost entirely within the cities of Granite City, Madison, and Venice, in Madison County, Illinois, approximately two miles east of downtown St. Louis, Missouri. The Site has been divided into three principal areas: the Main Industrial Site, the Adjacent Residential Areas (within the cities of Granite City, Madison, and Venice), and the Remote Fill Areas. The Main Industrial Site is approximately 30 acres in size; the Adjacent Residential Areas consist of approximately 500 acres; and the Remote Fill Areas include locations in Eagle Park and Venice Township [Woodward-Clyde Consultants (WWC) 1995].

Operations ceased at the site in 1983. Lead and cadmium concentrations have been observed in surface soils and groundwater at on-site and off-site locations (IEPA, 1983). The off-site locations at which lead concentrations have been observed include Eagle Park and Venice Township, south of the site, where hard rubber from battery cases was utilized as fill material and/or paving material by private parties and Venice Township. Construction of a multi-media cap over a former waste pile at the Main Industrial Site is scheduled for completion in August 1999. Remedial actions are also currently underway to address source control at the Remote Fill Areas.

2.2 U.S. EPA Selected Groundwater Remedy

O'Brien & Gere based the selection of the proposed groundwater remedy for the Site on the analytical results of groundwater samples collected during the RI/FS (O'Brien & Gere Engineers, Inc. 1988) and WWC during the PDFI (WWC 1995). The proposed remedy consists of groundwater containment on the Main Industrial Site and monitoring in the Remote Fill Areas. The active system would be designed to contain groundwater emanating from the Main Industrial Site by installing a series of extraction wells, which would be pumped at a rate sufficient to control off-site groundwater flow. The water produced from the extraction wells would be pre-treated, if necessary, and would be discharged to the local Publicly Owned Treatment Works (POTW). Because the extent of groundwater impacted with lead and other metals at the Main Industrial Site has not been completely defined by previous studies,

additional monitoring wells were required by USEPA and are proposed here as part of the present Pre-Design Investigation. The wells at the Main Industrial Site will be located downgradient of the former Taracorp waste pile. The groundwater action for the Remote Fill Areas will consist of long-term monitoring, and usage restriction.

2.3 Regional Hydrogeology

The Granite City area is situated within a bedrock valley cut by the Mississippi River (Bergstrom and Walker 1956). The preglacial bedrock valley has been filled with Recent Alluvium and glacially derived valley-train materials (collectively referred to as the valley fill). The valley fill in the Granite City area varies between approximately 80 and 120 feet thick, with the materials thinning to the west towards Chain of Rocks Canal. The river channel at Chain of Rocks, which is west of the Chain of Rocks Canal, is reported to intersect bedrock (Bergstrom and Walker 1956).

The valley fill includes silts and clays at or near the surface deposited during recession of floodwaters. As is evidenced by Horseshoe Lake, an oxbow type lake, immediately to the east of Granite City, the Mississippi River has migrated over time across the broad bottom lands, which are 6 to 8 miles wide in the Granite City area. The channel migration, the associated cut-and-fill actions, and the flooding have produced complex hydrogenous deposits of varying thicknesses.

Investigations conducted by the Illinois State Water Survey (Piskin and Bergstrom 1975) indicate that the sand and sand and gravel deposits below the surficial silts and clays, become coarser with depth. At the base of the valley fill deposits in the Granite City area; 20 to 35 feet of clean sand and gravel are encountered (Bergstrom and Walker 1956). These deposits become finer to the east and grade into dominantly sand and silt in the Horseshoe Lake area.

Groundwater in the Granite City area occurs in valley fill deposits under water table or leaky artisan conditions, depending upon the extent to which fine- and coarse-grained sediments are interbedded. Locally, portions of the surficial silts and clay may be saturated and would therefore be under water-table conditions. Bedrock while saturated, is generally not considered a significant source of groundwater in the bottomlands area. The bedrock is generally of lower permeability with water being yielded primarily from fractures.

Generally groundwater flow in the valley fill deposits is from northeast to southwest in the Granite City area. Locally, groundwater pumping and the associated cone of depression will change the regional groundwater flow pattern. From 1978 to 1980, groundwater level monitoring performed by the Illinois State Water Survey (Collins

and Richards 1986) identified a water-table depression on the west side of Granite City, which appears to be associated with a pumping center.

Rainfall and floods recharge groundwater under non-pumping conditions. The Mississippi River is a major groundwater discharge area under normal river stage conditions. Under high flow conditions when the river level is higher than the water table, the Mississippi River will serve as a recharge source for the valley fill aquifer. In situations where high volume pumping is occurring near the river, flow will be from the river toward the pumping center.

The Illinois Water Survey indicates that groundwater usage in the Granite City area is for industrial purposes and that fluctuations in groundwater usage were related to the cyclical nature of the area's steel industry (Collins and Richards 1986). The local water utility district, which serves Granite City and the adjacent communities of Madison and North Venice, indicates that it uses treated Mississippi River water in the area's distribution systems.

2.4 Nature and Extent of Impacted Groundwater

A summary of the results of previous groundwater investigations conducted at the Site by the Illinois Environmental Protection Agency (IEPA), O'Brien & Gere and WWC. The following summaries focus on well development, groundwater monitoring techniques and the analytical results.

2.4.1 Investigations Conducted by the IEPA

In 1981 and 1982, the IEPA conducted an investigation into the impacts to groundwater in the Granite City area from the 3-acre storage pile located within the city boundaries. The results of this investigation are summarized in a report entitled.

In October 1982, four monitoring wells (MW-101, MW-102, MW-103 and MW-104) were installed by Taracorp at the request of the IEPA. The analytical results of groundwater samples collected from these wells in November 1982 indicated that the downgradient well (MW-104) contained an elevated concentration of lead (0.05 parts per million [ppm]). However, the IEPA later questioned the integrity of these samples and actually discarded the results as invalid because the samples were not filtered in the field (IEPA 1984). Based on these data, the IEPA determined that additional soil and groundwater sampling should be conducted (IEPA 1984).

In July 1983, the IEPA installed eight monitoring wells (MW-105S, MW-105D, MW-106S, MW-106D, MW-107S, MW-107D, MW-108S, and MW-108D) at the Site.

These wells comprise a two-well cluster with "S" denoting a shallow well installed at the water table and "D" denoting a deep well installed 10 to 15 ft deeper than the shallow well. Specific details regarding well development were not included in the reports reviewed by ARCADIS Geraghty & Miller. The groundwater sampling logs from each of these sampling events specify that all samples were filtered in the field prior to preservation, and that field parameters for pH, specific conductance, and temperature were measured.

Groundwater samples were collected by the IEPA from Monitoring Wells MW-101, MW-102, MW-103 and MW-104 in January, February, June, August and November 1983 and from Monitoring Wells MW-105S, MW-105D, MW-106S, MW-106D, MW-107S, MW-107D, MW-108S and MW-108D in August and November 1983. The results of the sampling and analysis program indicated that the concentrations of lead in each of the monitoring wells sampled were below the Illinois General Use Water Quality Standard (35 Ill. Adm. Code 302.208) of 0.1 ppm.

Based on the data collected by IEPA in 1982 and 1983, impacts to groundwater quality were not an issue of concern for the Site. In addition, the concentrations of lead detected in the groundwater samples collected were below the MCL of 0.050 mg/L, which was in effect from 1975 through June 1991.

2.4.2 Investigations Conducted by O'Brien & Gere Engineers, Inc.

O'Brien & Gere conducted a Remedial Investigation/Feasibility Study (RI/FS) at the site between 1986 and 1987 on behalf of NL Industries. As part of this investigation, two monitoring wells (MW-109 and MW-110) were installed in July 1987. The specific well development techniques utilized by O'Brien & Gere were not included in the RI/FS Report (O'Brien & Gere Engineers, Inc. 1988). The RI/FS Report refers to the RI/FS Work Plan Addendum (O'Brien & Gere 1987), which specifies the well development techniques to be utilized during the RI field investigation.

The monitoring well development procedures summarized in Appendix D of the RI/FS Work Plan Addendum, identify three well development techniques that may be used to develop Monitoring Wells MW-109 and MW-110. The procedure specifies that "air surging, pumping, or bailing groundwater from the well would be conducted for a minimum of 2 hours until relatively sediment-free water was produced. The actual development technique used would depend on the size and depth of the well, and the volume of groundwater in the well" (O'Brien & Gere 1987). Although the development methods specified by O'Brien & Gere are generally acceptable methods, it does not appear that the development techniques were effective at adequately

developing these monitoring wells because groundwater samples collected from these wells were consistently very turbid.

In January, April, August and November 1987, O'Brien & Gere collected groundwater samples from monitoring wells at the site. The field sampling protocols specified in the RI/FS Report reference Appendix D of O'Brien & Gere's RI/FS Work Plan (O'Brien & Gere 1986). During each of the four groundwater sampling events conducted by O'Brien & Gere in 1987, groundwater samples were consistently filtered in the field prior to sample preservation for metals analysis. In addition, groundwater samples collected from five of the monitoring wells (MW-102, MW-106D, MW-108S, MW-108D and MW-110) were also analyzed for total lead.

The groundwater elevation data collected by O'Brien & Gere indicated that the shallow unconsolidated aquifer was south-southwesterly with a hydraulic gradient from 0.003 ft/ft to 0.00075 ft/ft. The south-southwesterly groundwater flow direction is towards the Mississippi River.

Tabulated summaries of RI/FS field investigation data are provided in Attachment 1 to this Work Plan. The tabulated summaries include monitoring well construction details, sampling history for each monitoring well, and analytical data collected by O'Brien & Gere during the remedial investigation. This summary was excerpted from the Review and Comments on the U.S. EPA Proposed Groundwater Remedy prepared by ARCADIS Geraghty & Miller for the NL/Taracorp Superfund Site, dated April 1995.

2.4.3 Investigations Conducted by Woodward-Clyde Consultants

After completion of the RI/FS by O'Brien & Gere, WWC conducted the PDFI between November 1991 and June 1992 (WWC 1993). The objective of the PDFI was to collect the data necessary to implement a remedial action for the site. As part of the PDFI, four monitoring wells (MW-103-91, MW-104-92, MW-109-92 and MW-111-92) were installed to depths of 69 to 72 ft below grade to evaluate impacts to deeper groundwater zones at the site.

As part of the PDFI, WWC conducted groundwater sampling in July 1992. After completion of the PDFI, WWC conducted groundwater monitoring in October 1992, March 1993, September 1993, April 1994, July 1994 and October 1994.

A summary of the historical analytical data collected by WWC at the Site is presented in Attachment 2 to this Work Plan. This summary was excerpted from the Second Addendum to the Feasibility Study prepared by WWC for the NL/Taracorp Superfund Site, dated February 1995.

3.0 Description of Pre-Design Investigations

As previously discussed, the existing wells at the Main Industrial Site have not been sampled in nearly five years. The first Pre-Design Investigation activity to be performed by ARCADIS Geraghty & Miller for the Group will be to redevelop the existing wells to ensure that they are still suitable as monitoring points capable of producing low turbidity samples. We have assumed that five of the existing 18 wells will need to be replaced. We propose to add one deeper well to two already existing clusters and five additional well clusters to further define the extent of potentially affected groundwater.

A summary of the proposed Pre-Design Investigation monitoring well installations is presented in Table 1. Each of the 26 newly installed wells will be logged by retrieving split-barrel soil samples as installation proceeds. We propose that pre-packed well screens be used on all newly installed wells to ensure a proper filter pack for the wells. The native materials at the NL Industries/Taracorp Site often make the installation of a filter packs problematic because of heaving.

3.1 Well Development

The initial task to be performed as part of the Pre-Design Investigation will be an evaluation of the condition of the existing wells at the Main Industrial Site. The existing wells will be redeveloped so that they produce sediment free water, to the extent possible. If redevelopment is not successful, some of the wells may be replaced.

3.2 New Monitoring Well Installations

Following the redevelopment and/or replacement of the existing wells at the Main Industrial Site, additional well clusters will be installed, one within the site boundaries (GMMW 112S, 112D) and four at off-site locations (GMMW 113S, 113D; GMMW 115S, 115D; GMMW 116S, 116D; and GMMW 124S, 124D). The tentatively identified locations for the new monitoring well clusters at the Main Industrial Site are shown on Figure 2. In addition, single monitoring wells will be installed at the off-site locations shown on Figures 3, 4 and 7. The exact location of these wells will be determined following review of property ownership and access requirements. In general, however, the new wells will be placed downgradient (southwest of the site) (GMMW 123 and GMMW 125) and side gradient (GMMW 126) for the purposes of defining the groundwater plume.

Two new wells (GMMW 108X, GMMW 109X) will also be installed at the Main Industrial Site at Well Clusters 108 and 109 (where a downward gradient has been historically observed) forming three well clusters at these locations. The third well at these clusters is designed to verify that the constituents of concern are not present at depths below the depths monitored to date in the surficial aquifer.

Three (3) new shallow monitoring wells will be installed in each of the Remote Fill Areas Venice Township and Eagle Park Acres). Because of the shallow nature of the potential source materials in the remote areas, installation of deeper monitoring wells in these areas is not planned as part of the present investigations, unless sampling of the newly installed shallow wells indicates a need. The tentatively identified locations for the new monitoring wells in the Remote Fill Areas are shown on Figure 5 (Eagle Park Acres) and Figure 6 (Venice Township). Installation of the new monitoring wells at the tentatively identified locations in Eagle Park Acres and Venice Township is subject identifying property owners, and receiving access from property owners for installation of the wells in these locations.

A summary of the proposed well construction details for the new monitoring wells is presented in Table 2.

3.3 Groundwater Sampling

Two rounds of groundwater samples will be collected from the existing and the newly installed monitoring wells at the Main Industrial Site during the Pre-Design Investigation. During the initial round, groundwater samples will be collected from each of the monitoring wells at the Main Industrial Site and submitted for analysis of the Target Analyte List (TAL) of metals for both total metals (i.e., unfiltered samples) and dissolved metals (i.e., filtered samples). The unfiltered set of groundwater samples from the monitoring wells will also be analyzed in the laboratory for selected geochemical parameters (total dissolved solids, alkalinity, sodium, potassium, calcium, magnesium, sulfate and nitrate species). In addition, field measurements of the pH, turbidity, temperature, conductivity, and oxidation-reduction potential (ORP) of the shallow groundwater at each well location will be made at the time of sample collection.

During the initial sampling event at the Main Industrial Site, groundwater samples will also be collected from each of the monitoring wells using low flow techniques (developed several years ago to minimize the turbidity in groundwater samples). The groundwater samples collected using low flow techniques will be analyzed in the laboratory for TAL lead and cadmium only, and two additional metals (based on the results of the samples analyzed for total metals concentrations). The groundwater

samples collected using low-flow sampling methods will be held in the project laboratory until the laboratory analyses of the unfiltered groundwater samples have been completed. (The holding time for the Method 6010 Target Analyte List metals analysis is six months). The two most frequently detected TAL analytes (other than lead and cadmium) with the highest quantified concentrations will be identified from the analytical results for the unfiltered groundwater samples collected during the initial round. ARCADIS Geraghty & Miller will then instruct the project laboratory to analyze for these two analytes (in addition to lead and cadmium) in the held groundwater samples collected using low-flow sampling methods.

A second round of groundwater sampling will be conducted at the Main Industrial Site following receipt of the results from the first round of sampling. Groundwater samples collected during the second round of sampling will be analyzed for the reduced set of TAL metals for both dissolved (filtered) and total (unfiltered) metals. The groundwater samples collected for total metals analyses will be collected using low-flow sampling methods. Field measurements of pH, conductivity, ORP, temperature and turbidity will also be collected during the second sampling event.

During the initial groundwater sampling event at the Main Industrial Site, groundwater samples will also be collected from the newly installed wells in the Remote Fill Areas (Venice Township and Eagle Park Acres). The groundwater samples collected from the Remote Fill Areas will be submitted for laboratory analysis of TAL lead for both total lead (i.e., unfiltered samples) and dissolved lead (i.e., filtered samples). The groundwater samples collected for total lead analysis will be collected using low-flow sampling methods. The results of the lead analysis will be used as an indicator of potential impacts to groundwater in the Remote Fill Areas as a result historic filling activities.

In addition, field measurements of the pH, turbidity, temperature, conductivity, and oxidation-reduction potential (ORP) of the shallow groundwater at each well location in the Remote Fill Areas will be made at the time of sample collection.

3.4 Cation Exchange Capacity

Laboratory analyses will be done on up to twenty soil samples that are representative of soil conditions at the site. The samples will be subjected to cation exchange capacity testing to determine the ability of the soil to immobilize the contaminant metals in the groundwater. This work will be done in ARCADIS Geraghty & Miller's treatability laboratory in Raleigh, North Carolina or a suitable commercial laboratory and will be conducted according to U.S.EPA Method 9081.

3.5 Geochemical Modeling

The potential reactions between water solutions of metals and the solid phases in the shallow aquifer will be modeled. Model(s) selected by ARCADIS Geraghty & Miller for this purpose will be provided to U.S. EPA for review. The model in widespread use is PHREEQEC by Plummer, Parkhurst, and Busenberg of the U.S. Geological Survey. PHREEQEC calculates the speciation (complex ion formation) of metals in solution (groundwater). It then can be used to compare solubility products of easily formed minerals, which contain the metals. Additionally, PHREEQEC contains a module that allows for the explicit calculation of adsorption reactions. The results of the experimentally derived cation exchange capacity tests will be input into the model to solve for changes in solution composition. The distribution of metals between immobile sites (precipitated solids and adsorption sites) and the mobile groundwater will then be modeled. These results will then be compared to the results of the groundwater sampling events to further evaluate the effects of different sampling methods and sample turbidity on detected metals concentrations.

4.0 Project Organization and Responsibility

Figure 7 presents a project organizational chart that shows management responsibilities of project personnel and lines of authority and communication. This hierarchy will be used to ensure that all team members are familiar with their expected roles in completing a specific assignment. In addition, the hierarchy will ensure that ARCADIS Geraghty & Miller meets the schedule required for project activities, and communicates satisfactorily with the Group and the regulatory agencies

The management responsibilities are described below:

U.S. EPA RPMs: Brad Bradley and Sheri Bianchin are the U.S. EPA's remedial project managers (RPMs) for the NL Industries/Taracorp Site. Mr. Bradley and Ms. Bianchin have the overall responsibility for administration of the remedial design.

TECHNICAL COMMITTEE: Six technical representatives of the NL Industries/Taracorp Superfund Site Group companies are responsible for technical strategic planning and overall coordination of the RD for the groundwater remedy at the Site.

TECHNICAL PROJECT MANAGER (TPM): Jeffrey Leed of Leed Environmental, Inc. is the TPM for the NL Industries/Taracorp Superfund Site Group, and the Project Coordinator as defined in the Consent Decree. The TPM is the primary contact with the U.S. EPA.

ARCADIS GERAGHTY & MILLER PROJECT MANAGER: Jack Kratzmeyer, the ARCADIS Geraghty & Miller Project Manager will hold overall responsibility for technical and quality-related matters for ARCADIS Geraghty & Miller. The Project Manager makes decisions on personnel assignments and the submission of reports. Although the actual preparation of written documents may be performed by other members of the project team, all of these documents will be subjected to ARCADIS Geraghty & Miller's QA/QC procedures and be reviewed and signed by the Project Manager and Project Director.

ARCADIS GERAGHTY & MILLER PROJECT DIRECTOR: Nicholas Valkenburg the ARCADIS Geraghty & Miller Project Director has overall responsibility for ensuring that the project meets required objectives and ARCADIS Geraghty & Miller's quality standards.

ARCADIS GERAGHTY & MILLER PROJECT ADVISOR: Konrad Banaszak, Ph.D. the ARCADIS Geraghty & Miller Project Advisor will be responsible for evaluating the groundwater and geochemistry data collected during the pre-design investigations.

ARCADIS GERAGHTY & MILLER FIELD TEAM LEADER: The ARCADIS Geraghty & Miller Field Team Leader, has the responsibility for leading and coordinating all of the activities undertaken during the predesign investigations. In addition, the field team leader is responsible for coordination and supervision of field staff. The ARCADIS Geraghty & Miller Field Team Leader reports to the ARCADIS Geraghty & Miller Project Manager.

ARCADIS GERAGHTY & MILLER FIELD TEAM: Geraghty & Miller will provide field staff for the project. The field staff will collect samples, operate field equipment and perform other field activities. The field staff report to and work under the direction of the ARCADIS Geraghty & Miller Field Team Leader.

ARCADIS GERAGHTY & MILLER TECHNICAL STAFF: The technical staff used on this project will be drawn from Geraghty & Miller's pool of corporate resources. Technical staff will be utilized to gather and analyze data and to prepare various reports. Technical staff will include engineers, geologists, hydrogeologists, and other specialists, as needed. The ARCADIS Geraghty & Miller Technical Staff report to the ARCADIS Geraghty & Miller Project Manager.

5.0 Remedial Design Schedule

Figure 8 presents the project schedule for the tasks and activities that will be performed by the Group in order to complete the Pre-Design Investigation and Remedial Design for groundwater. The project schedule assumes that the U.S. EPA will complete their review of project deliverables within 30 days. Subsequent to U.S. EPA's review and approval of the Pre-Design Investigation Work Plan, the Pre-Design activities will be initiated.

Following completion of the Pre-Design studies including two rounds of groundwater sampling, laboratory analysis, and geochemical modeling, ARCADIS Geraghty & Miller will submit:

1. A Remedial Design Work Plan that includes a final report of the Pre-Design Investigation studies; and
2. The remaining remedial design reports (30%, 60%, 95%, and final designs).

TABLES

Table 1. Proposed Pre-Design Investigation Well Installations,
NL Industries/Taracorp Site, Granite City, Illinois.

Area	Well Depths (ft below grade)	Screen Lengths (ft)
Main Industrial Site		
Shallow (8)	20	10
Intermediate (5)	35 - 40	10
Deep (2) (Clusters MW-108 and MW-109)	45 - 55	10
replacement - shallow (3)	20	10
replacement - deep (2)	35 - 40	10
Remote Fill Areas		
Shallow (6)	20	10

Notes:

1. The number of replacements at the Main Industrial Site is estimated.

Table 2. Summary of Well Construction Details,
NL Industries/Taracorp Site, Granite City, Illinois.

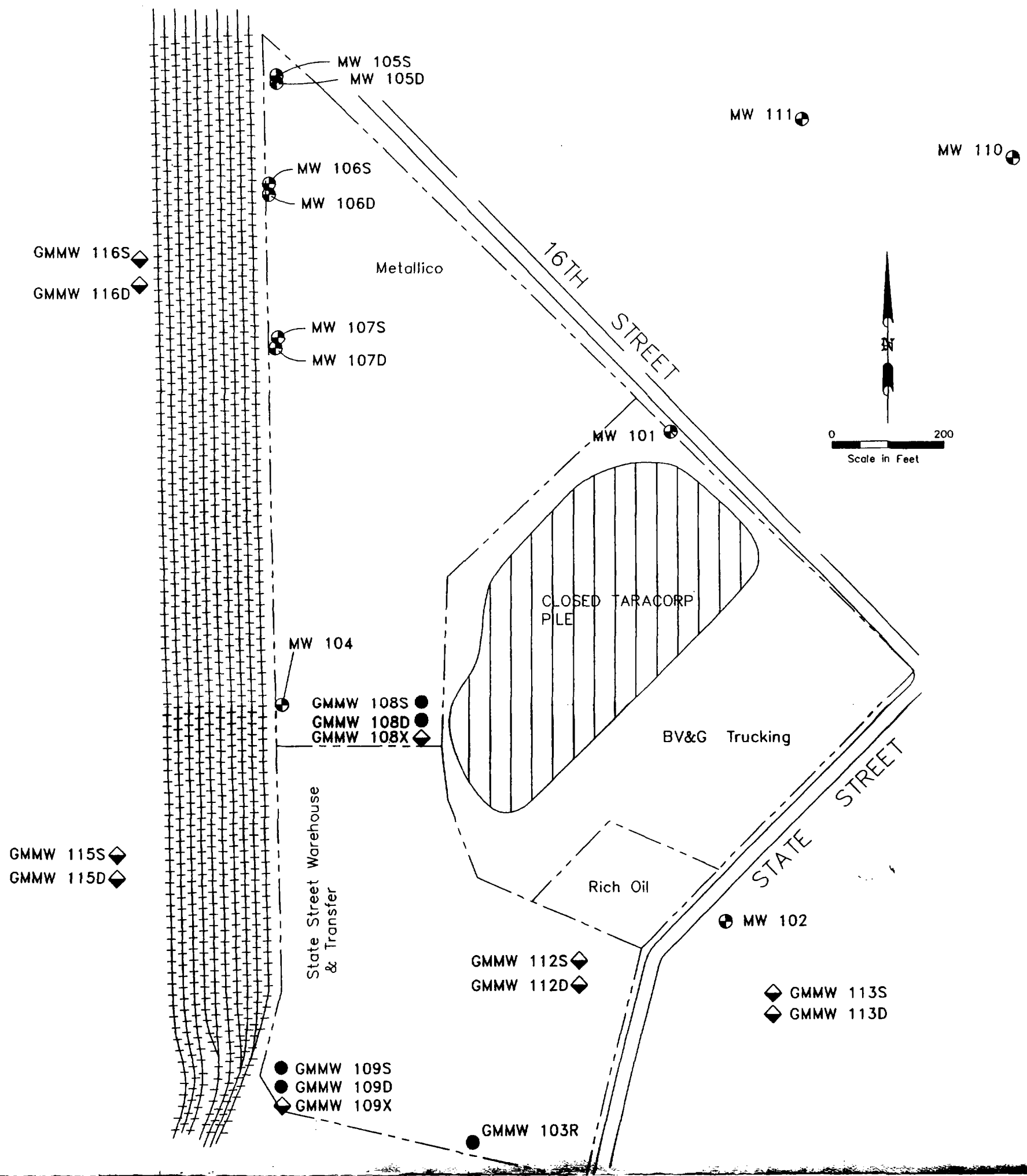
Well Construction Items	Main Industrial Site			Remote Fill Areas
Type	Shallow (S)	Intermediate (D)	Deep (X)	Shallow
Purpose	Further definition of groundwater quality at main area			Characterize groundwater quality
Total Depth (ft below grade)	20-25	35 -45	50	20-25
Borehole Diameter (inches)	8.25	8.25	8.25	8.25
Casing	2-inch diameter Schedule 40 PVC			2-inch diameter Schedule 40 PVC
Screen	Vee-Pack PVC pre-packed screen, with 2-inch inner diameter, 4-inch outer diameter 0.008 slot screen (10 feet in length)			Vee-Pack PVC pre-packed screen, with 2-inch inner diameter, 4-inch outer diameter 0.008 slot screen (10 feet in length)
Sand Pack	Uniformly graded silica sand extending 1 to 1.5 feet above top of Vee-Pack screen			Uniformly graded silica sand extending 1 to 1.5 feet above top of Vee-Pack screen
Seal	Bentonite 2 to 3 ft above sand pack			Bentonite 2 to 3 ft above sand pack
Grout	Bentonite/cement slurry to 1 ft bgs			Bentonite/cement slurry to 1 ft bgs
Surface Casing	4-inch diameter steel protective locking cover, 2.5 to 3 ft above grade/ or 8-inch diameter steel flush mounted type well cover			8-inch diameter steel flush mounted type well cover

ft bgs Feet below ground surface.
PVC Polyvinyl chloride.

FIGURES

SEE FIGURE 4 FOR LOCATION
OF MONITORING WELL GMMW 126

SEE FIGURE 3 FOR LOCATION
OF MONITORING WELL GMMW 125



◆ GMMW 124S
◆ GMMW 124D

LEGEND

- MW101 ⊕ EXISTING MONITORING WELL/IDENTIFICATION
 - - - - - PROPERTY LINE
 GMMW 112S,D ◆ PROPOSED MONITORING WELL CLUSTER/IDENTIFICATION (Shallow and Deep depths)
 GMMW 109X ◆ PROPOSED DEEPER MONITORING WELL/IDENTIFICATION
 GMMW 103R ● PROPOSED REPLACEMENT MONITORING WELL/IDENTIFICATION
 S SHALLOW (12-34 FEET BELOW LAND SURFACE)
 D DEEP (27-44 FEET BELOW LAND SURFACE)
 X DEEPER (40-50 FEET BELOW LAND SURFACE)

Source: Woodward-Clyde Consultants, Figure No.1,
November 11, 1993, Proj. no. C3M11Q.

ARCADIS GERAGHTY & MILLER

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DRAWN
NEK

DATE
August 16, 2000

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J KRATZMEYER

DEPARTMENT MANAGER
J KRATZMEYER

LEAD DESIGN PROF.
N Karmali

CHECKED
A TOKARSKI

PROJECT NUMBER
C1001003.0002

FIGURE NUMBER
2

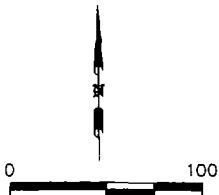
MAIN INDUSTRIAL SITE
MONITORING WELL LOCATIONS
PRE-DESIGN INVESTIGATION WORK PLAN
NL INDUSTRIES/TARACORP SUPERFUND SITE
GRANITE CITY, ILLINOIS

Drwn By/Plot Scale: NEK/STF

Filename: 00C10326.DWG

Project No.: C1001003.0002

Date: 08/16/00



LEGEND

GMMW 125  MONITORING WELL LOCATION/IDENTIFICATION

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MAIN INDUSTRIAL SITE
MONITORING WELL LOCATION GMMW 125
GRANITE CITY STEEL
NL INDUSTRIES/TARACORP SUPERFUND SITE
GRANITE CITY, ILLINOIS

PROJECT NUMBER
C11003.002

FIGURE NUMBER

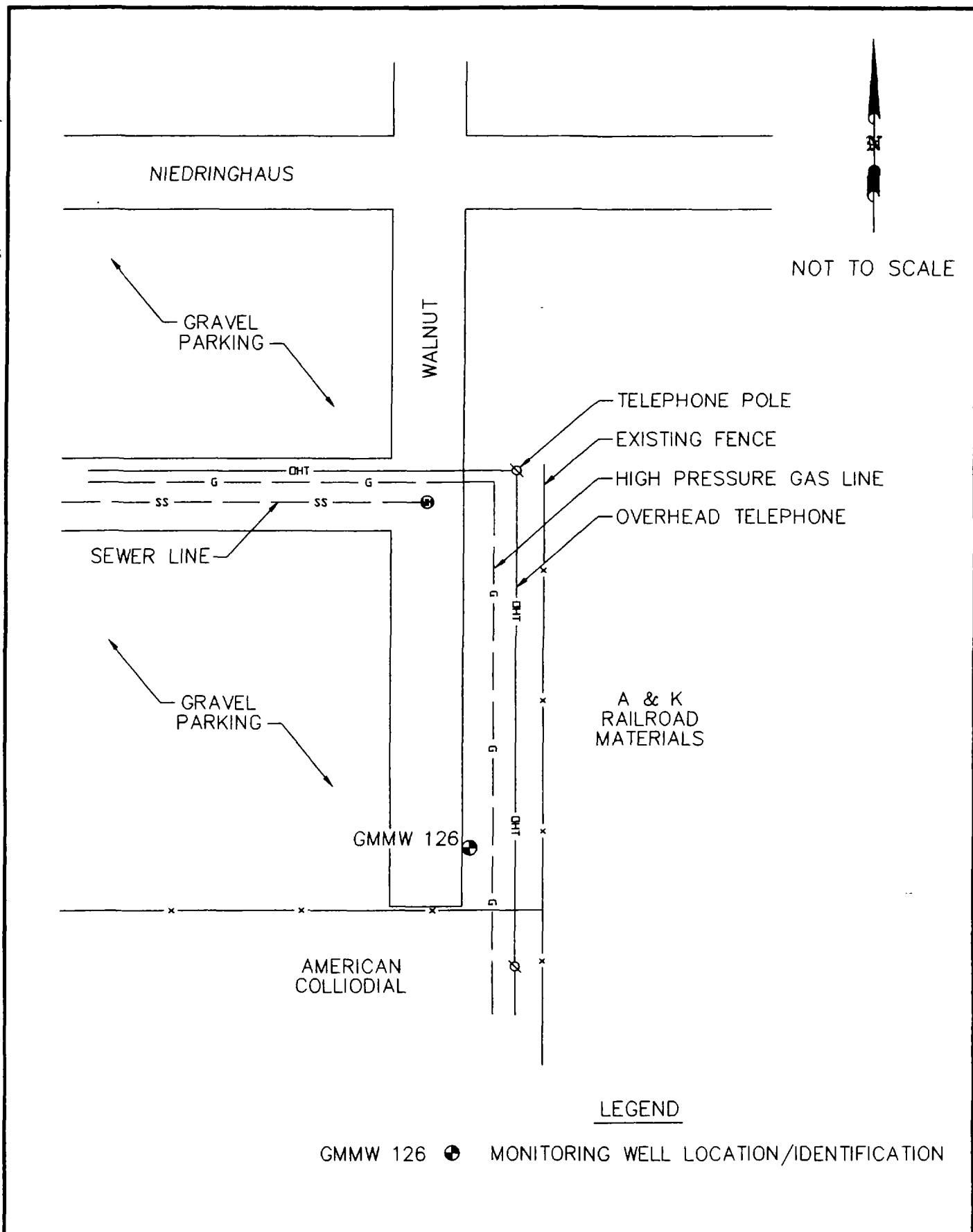
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Drwn By/Plot Scale: NEK/1=2

Filename: 00G10327.DWG

Project No.: C1001003.0002

Date: 08/16/00



LEGEND

GMMW 126 ● MONITORING WELL LOCATION/IDENTIFICATION

ARCADIS GERAGHTY & MILLER



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MONITORING WELL LOCATION
GRANITE CITY RIGHT-OF-WAY
PRE-DESIGN INVESTIGATION WORK PLAN
NL INDUSTRIES/TARACORP SUPERFUND SITE
GRANITE CITY, ILLINOIS

PROJECT NUMBER
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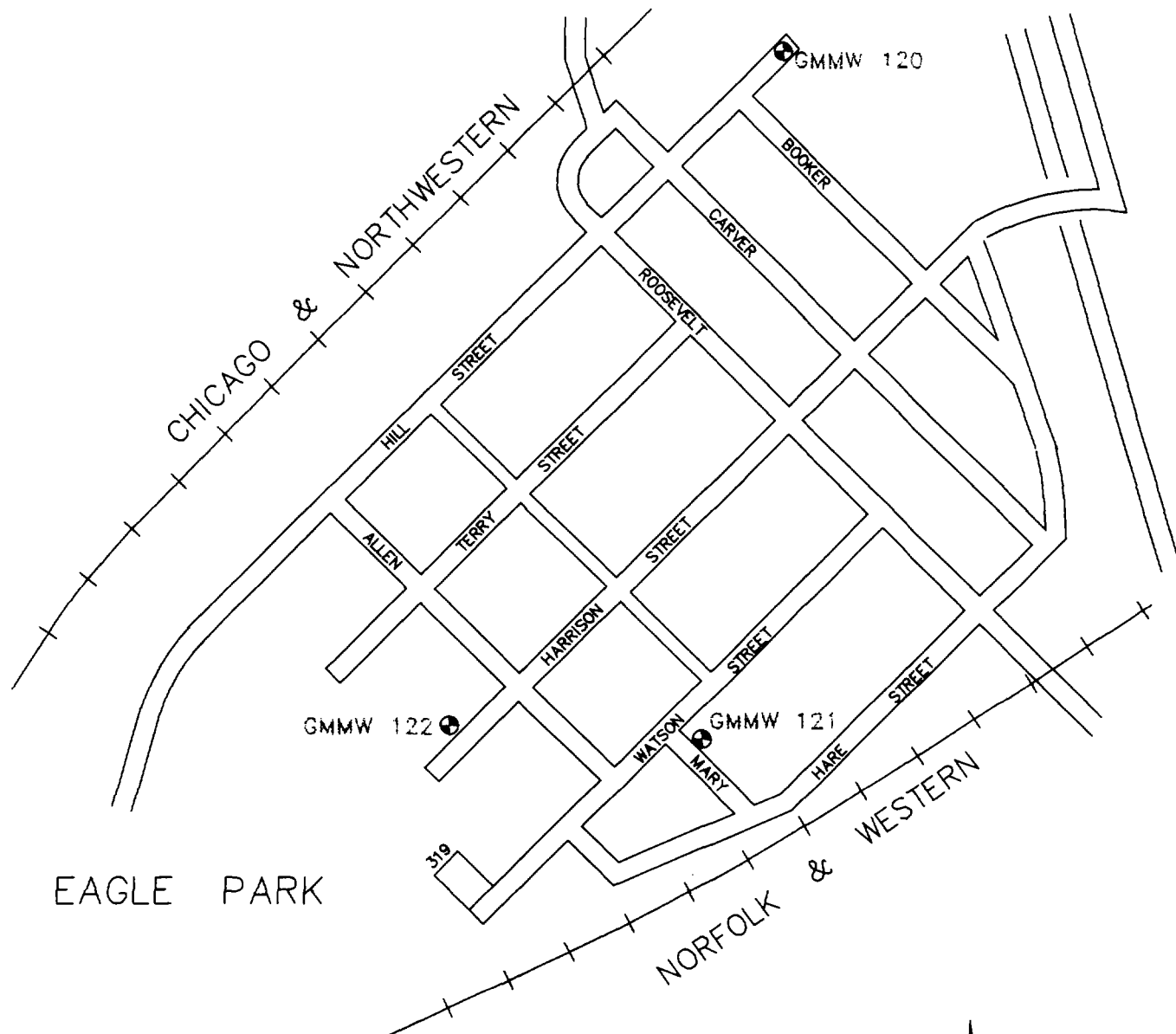
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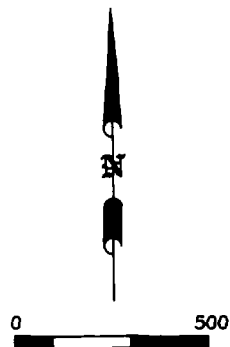
Project No.: C1001003.0002

Date: 08/16/00



LEGEND

GMMW 120 + PROPOSED SHALLOW MONITORING WELL/
IDENTIFICATION



Basemap Source: Woodward-Clyde Consultants,
Figure 1-6, June 1, 1994, Proj. No. C3M11Q.

ARCADIS GERAGHTY & MILLER

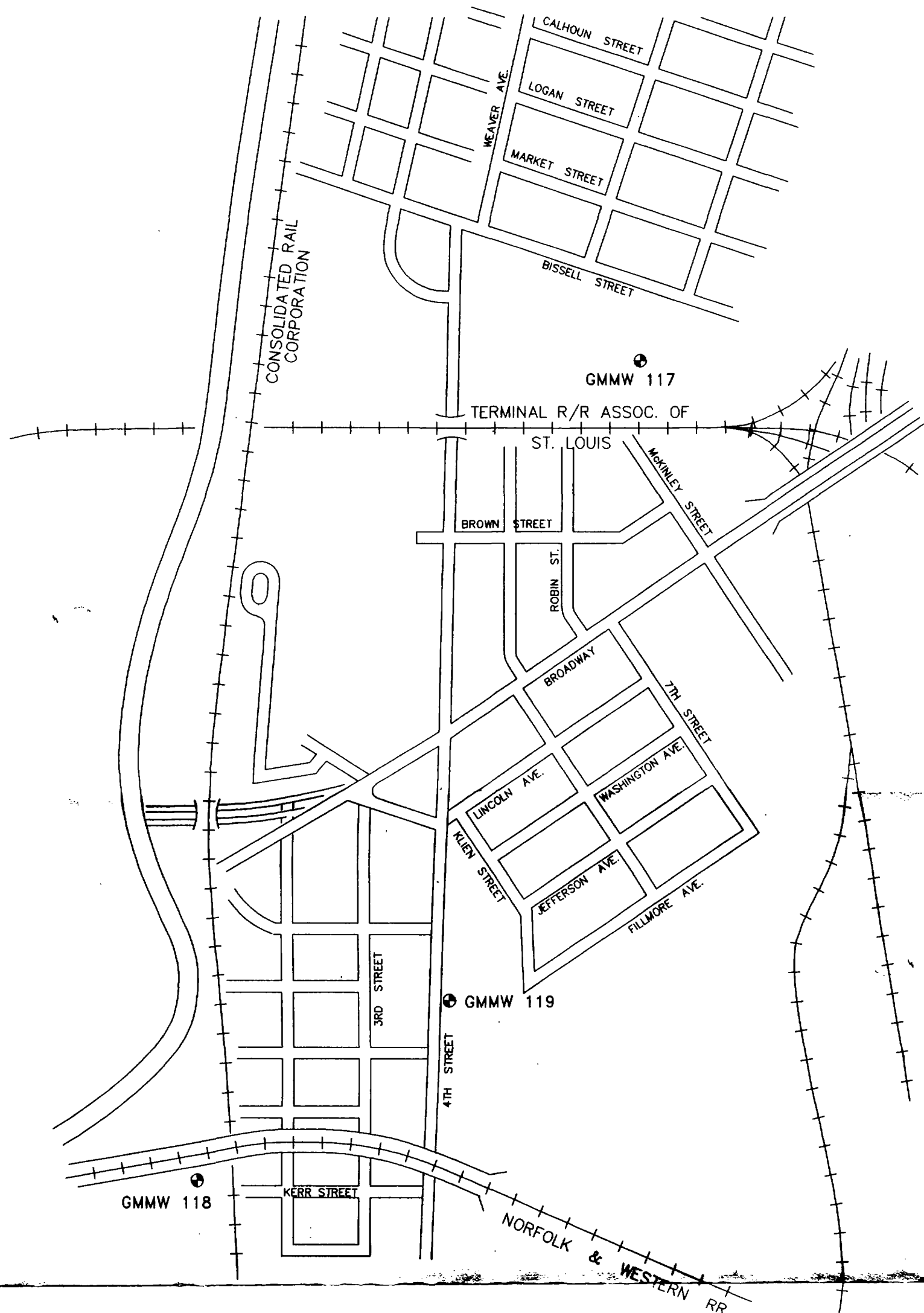


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EAGLE PARK ACRES
NEW MONITORING WELL LOCATIONS
PRE-DESIGN INVESTIGATION WORK PLAN
NL INDUSTRIES/TARACORP SUPERFUND SITE
GRANITE CITY, ILLINOIS

PROJECT NUMBER
C1003.002

FIGURE NUMBER
5

**LEGEND**

GMMW 117 ● PROPOSED SHALLOW MONITORING WELL/IDENTIFICATION

0 600

Scale in Feet

Basemap Source: Woodward-Clyde Consultants, Figure No. 1-7,
February 14, 1994, Proj. No. C3M11Q.**ARCADIS GERAGHTY & MILLER**30 East Wacker Drive
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Tel: 312/253-6700 Fax: 312/253-7887DRAWN
NEK

DATE

August 16, 2000

PROJECT MANAGER

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DEPARTMENT MANAGER

J. KRATZMEYER

LEAD DESIGN PROF.

H. KAMATA

CHECKED

A. TOKARSKI

PROJECT NUMBER

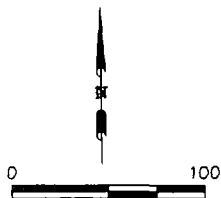
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FIGURE NUMBER

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VENICE TOWNSHIP
NEW MONITORING WELL LOCATIONS
PRE-DESIGN INVESTIGATION WORK PLAN
NL INDUSTRIES/TARACORP SUPERFUND SITE
GRANITE CITY, ILLINOIS

Date: 08/16/00

GMMW 123 MONITORING WELL LOCATION/IDENTIFICATION

35 East Wacker Drive
Suite 1000, Chicago, Illinois 60601
Tel: 312/263-6703 Fax: 312/263-7897



MAIN INDUSTRIAL SITE
MONITORING WELL LOCATION GMMW 123
12TH STREET AND MADISON AVENUE
NL INDUSTRIES/TARACORP SUPERFUND SITE
GRANITE CITY, ILLINOIS

PROJECT NUMBER
CI1003.002

FIGURE NUMBER
7

APPENDIX A

**Field Sampling Plan, Pre-Design Investigation,
NL Industries/Taracorp Superfund Site, Granite City, Illinois**

Pre-Design Investigation Work Plan For Groundwater
NL Industries/Taracorp Superfund Site
Granite City, Illinois

APPENDIX A

Field Sampling Plan

ARCADIS Geraghty & Miller, Inc.
35 East Wacker Drive, Suite #1000
Chicago, Illinois 60601

REPORT

August 2000

PRE-DESIGN INVESTIGATION WORK PLAN FOR GROUNDWATER
NL INDUSTRIES/TARACORP SUPERFUND SITE
GRANITE CITY, ILLINOIS

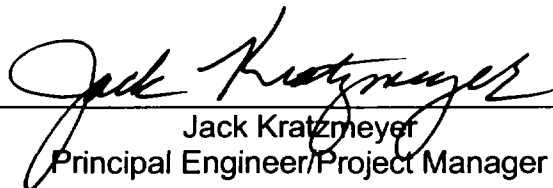
APPENDIX A

FIELD SAMPLING PLAN

August 25, 2000

Prepared by **ARCADIS Geraghty & Miller, Inc.**

Charlene Howell
Staff Engineer



Jack Kratzmeyer
Principal Engineer/Project Manager



Nicholas Valkenburg, C.P.G.
Associate/Project Officer

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1. Proposed Pre- Design Investigation Well Installations.
2. Summary of Pre-Design Investigation Well Construction Details.
3. Sampling Activities, Locations and Frequencies for the Pre-Design Investigation.

FIGURES

1. Site Location Map
2. Existing and Proposed Monitoring Well Locations - Main Industrial Site
3. Proposed Monitoring Well Location GMMW 125 – Main Industrial Site
4. Proposed Monitoring Well Location GMMW 126 – Main Industrial Site
5. Existing and Proposed Monitoring Well Locations - Eagle Park Acres
6. Existing and Proposed Monitoring Well Locations -Venice Township
7. Proposed Monitoring Well Location GMMW 123 – Main Industrial Site

ATTACHMENTS

- A-1. Standard Operating Procedures for Field Activities
- A-2. ASTM Testing Methods 1452 and 5092
- A-3. Field Data Forms
- A-4. Instructions for Operation of YSI 6000 Water Quality Meter

drilling and between each borehole, the auger flights, drill rig, and all downhole equipment will be decontaminated with a pressurized steam cleaner.

3.2.1 Well Construction

A total of twenty-six (26) monitoring wells are expected to be installed as part of the proposed Pre-Design Investigation. This total includes the following:

- An estimated five (5) replacement wells at the Main Industrial Site;
- Five (5) new well clusters (shallow and intermediate depths) at or near the Main Industrial Site;
- Two (2) new deep wells at existing clusters MW108 and MW109;
- Three (3) new shallow off-site monitoring wells at the Main Industrial Site; and
- Three (3) new wells at each of the two remote fill areas referred to as Venice Township and Eagle Park Acres.

The existing and new well locations are shown on Figure 2 (Main Industrial Site), Figure 3 (off-site Main Industrial Site), Figure 4 (off-site Main Industrial Site), Figure 5 (Eagle Park Acres), Figure 6 (Venice Township), and Figure 7 (off-site Main Industrial Site). The well installations will be performed using a truck-mounted drill rig and hollow-stem augers. Table 1 presents a summary of the anticipated depths and screen lengths for each well. The monitoring wells will be installed by Rock & Soil Drilling Corporation of St. Charles, Illinois, or another qualified drilling subcontractor, under the supervision of an ARCADIS Geraghty & Miller geologist. Continuous soil samples will be collected from the unsaturated zone in each of the soil borings. The soil samples will be screened in the field for visual signs of contamination. During drilling operations, the lithology of the soil samples will be classified in accordance with the Unified Soil Classification System (ASTM D2487). Refer to ARCADIS Geraghty & Miller SOP T116 "Borehole Soil Logging" (Attachment A-1).

The well construction details are summarized in Table 2. The SOP for well installation operations is provided in Attachment A-1, "T105-Monitoring Well Installation Unconsolidated Formation". All downhole equipment will be steam cleaned between each location and sampling equipment will be decontaminated with a non-sudsing detergent and rinsed with distilled water between each sample interval.

Each well will be developed by overpumping and surging (surge block or air lift), to remove a minimum of ten well volumes or until water clarity is achieved. All soil cuttings, development fluid, and decontamination water will be drummed, or otherwise contained and staged at the Main Industrial Site, for subsequent characterization and disposal, as appropriate.

3.2.2 Cation Exchange Soil Sampling

During well installation soil samples will be collected from a range of depth intervals at each boring location. Up to twenty (20) of these soil samples will be selected for laboratory testing of cation exchange capacity. This analysis will be performed in the ARCADIS Geraghty & Miller treatability laboratory in Raleigh, NC, or at a suitable commercial laboratory and will be conducted in accordance with U.S. EPA Method 9081.

Table 1. Proposed Pre-Design Investigation Well Installations,
NL Industries/Taracorp Site, Granite City, Illinois.

Area	Well Depths (ft below grade)	Screen Lengths (ft)
Main Industrial Site		
Shallow (8)	20	10
Intermediate (5)	35 - 40	10
Deep (2) (Clusters MW-108 and MW-109)	45 - 55	10
replacement - shallow (3)	20	10
replacement - deep (2)	35 - 40	10
Remote Fill Areas		
Shallow (6)	20	10

Notes:

1. The number of replacements at the Main Industrial Site is estimated.

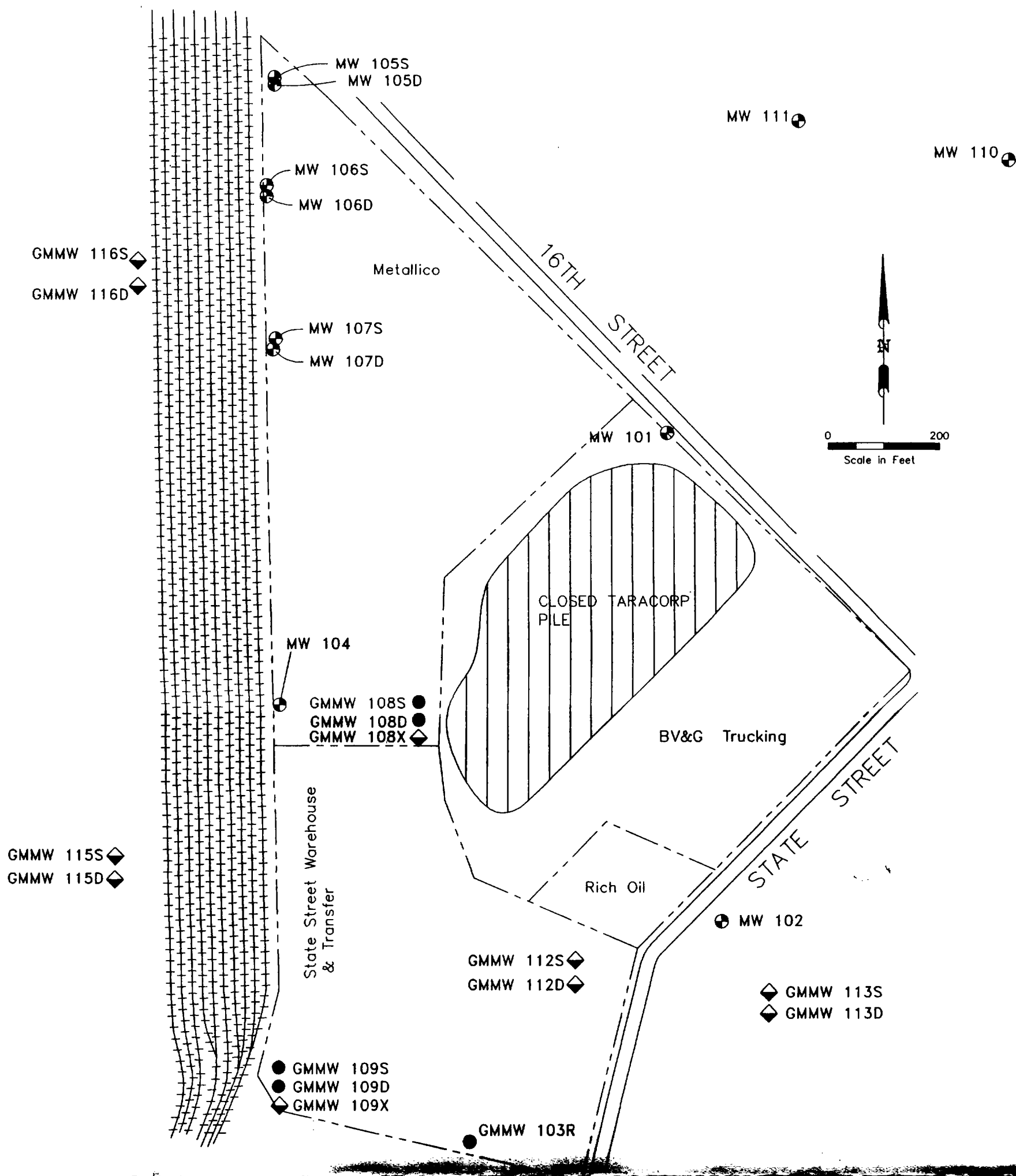
Table 2. Summary of Well Construction Details,
NL Industries/Taracorp Site, Granite City, Illinois.

Well Construction Items	Main Industrial Site			Remote Fill Areas
Type	Shallow (S)	Intermediate (D)	Deep (X)	Shallow
Purpose	Further definition of groundwater quality at main area			Characterize groundwater quality
Total Depth (ft below grade)	20-25	35 -45	50	20-25
Borehole Diameter (inches)	8.25	8.25	8.25	8.25
Casing	2-inch diameter Schedule 40 PVC			2-inch diameter Schedule 40 PVC
Screen	Vee-Pack PVC pre-packed screen, with 2-inch inner diameter, 4-inch outer diameter 0.008 slot screen (10 feet in length)			Vee-Pack PVC pre-packed screen, with 2-inch inner diameter, 4-inch outer diameter 0.008 slot screen (10 feet in length)
Sand Pack	Uniformly graded silica sand extending 1 to 1.5 feet above top of Vee-Pack screen			Uniformly graded silica sand extending 1 to 1.5 feet above top of Vee-Pack screen
Seal	Bentonite 2 to 3 ft above sand pack			Bentonite 2 to 3 ft above sand pack
Grout	Bentonite/cement slurry to 1 ft bgs			Bentonite/cement slurry to 1 ft bgs
Surface Casing	4-inch diameter steel protective locking cover, 2.5 to 3 ft above grade/ or 8-inch diameter steel flush mounted type well cover			8-inch diameter steel flush mounted type well cover

ft bgs Feet below ground surface.
PVC Polyvinyl chloride.

SEE FIGURE 4 FOR LOCATION
OF MONITORING WELL GMMW 126

SEE FIGURE 3 FOR LOCATION
OF MONITORING WELL GMMW 125



◆ GMMW 124S
◆ GMMW 124D

LEGEND

- MW101 ● EXISTING MONITORING WELL/IDENTIFICATION
 - - - - - PROPERTY LINE
 GMMW 112S,D ◆ PROPOSED MONITORING WELL CLUSTER/IDENTIFICATION (Shallow and Deep depths)
 GMMW 109X ◆ PROPOSED DEEPER MONITORING WELL/IDENTIFICATION
 GMMW 103R ● PROPOSED REPLACEMENT MONITORING WELL/IDENTIFICATION
 S SHALLOW (12-34 FEET BELOW LAND SURFACE)
 D DEEP (27-44 FEET BELOW LAND SURFACE)
 X DEEPER (40-50 FEET BELOW LAND SURFACE)

Source: Woodward-Clyde Consultants, Figure No.1,
November 11, 1993, Proj. no. C3M11Q.

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NEK

DATE
August 16, 2000

MAIN INDUSTRIAL SITE
MONITORING WELL LOCATIONS
PRE-DESIGN INVESTIGATION WORK PLAN
NL INDUSTRIES/TARACORP SUPERFUND SITE
GRANITE CITY, ILLINOIS

PROJECT MANAGER
J KRATZMEYER

LEAD DESIGN PROF.
H Karmala

PROJECT NUMBER
C1001003.0002

DEPARTMENT MANAGER
J KRATZMEYER

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A TOKARSKI

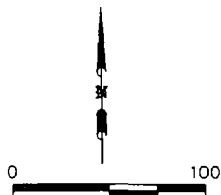
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Filename: OOC10326.DWG

Project No: C1001003.0002

Date: 08/16/00



LEGEND

GMMW 125 ● MONITORING WELL LOCATION/IDENTIFICATION

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MAIN INDUSTRIAL SITE
MONITORING WELL LOCATION GMMW 125
GRANITE CITY STEEL
NL INDUSTRIES/TARACORP SUPERFUND SITE
GRANITE CITY, ILLINOIS

PROJECT NUMBER
C11003.002

FIGURE NUMBER

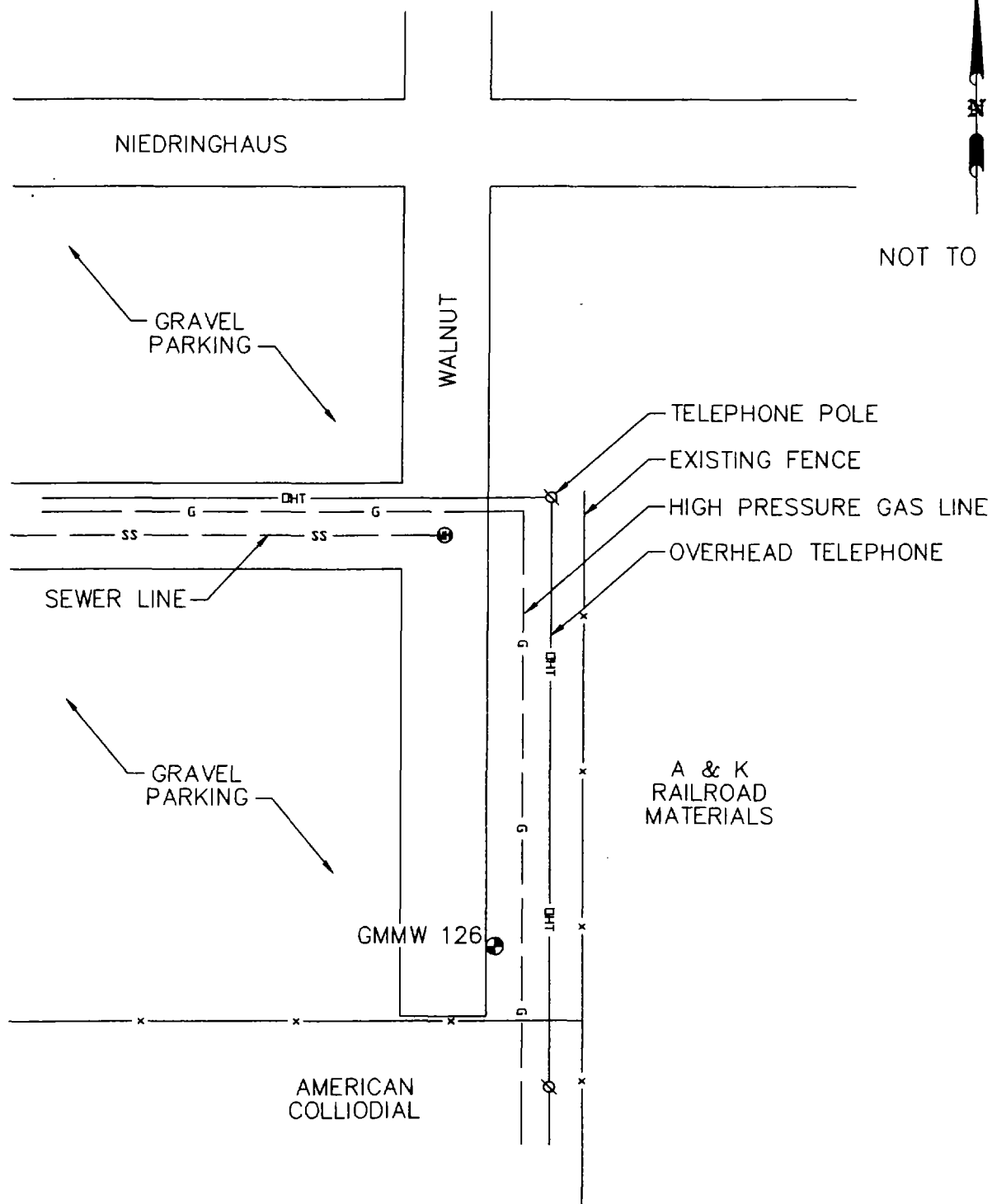
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Project No.: C1001003.0002

Date: 08/16/00



LEGEND

GMMW 126 ● MONITORING WELL LOCATION/IDENTIFICATION

ARCADIS GERAGHTY & MILLER



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Tel: 312/263-6703 Fax: 312/263-7887

MONITORING WELL LOCATION
GRANITE CITY RIGHT-OF-WAY
PRE-DESIGN INVESTIGATION WORK PLAN
NL INDUSTRIES/TARACORP SUPERFUND SITE
GRANITE CITY, ILLINOIS

PROJECT NUMBER
C11003.02

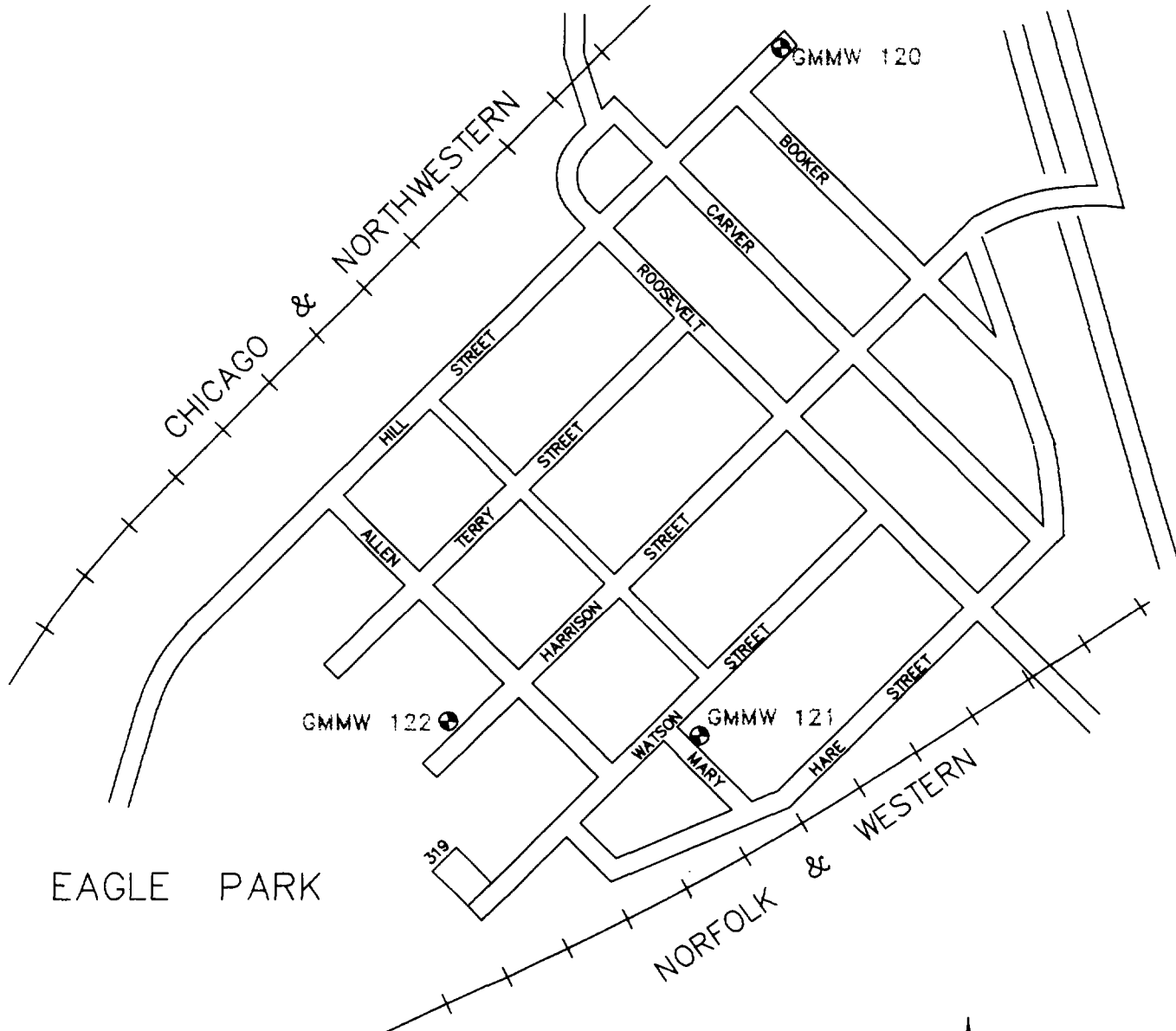
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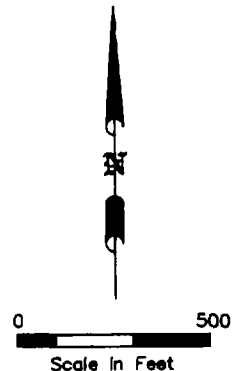
Project No.: C1001003.0002

Date: 08/16/00



LEGEND

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IDENTIFICATION



Basemap Source: Woodward-Clyde Consultants,
Figure 1-6, June 1, 1994, Proj. No. C3M11Q.

ARCADIS GERAGHTY & MILLER

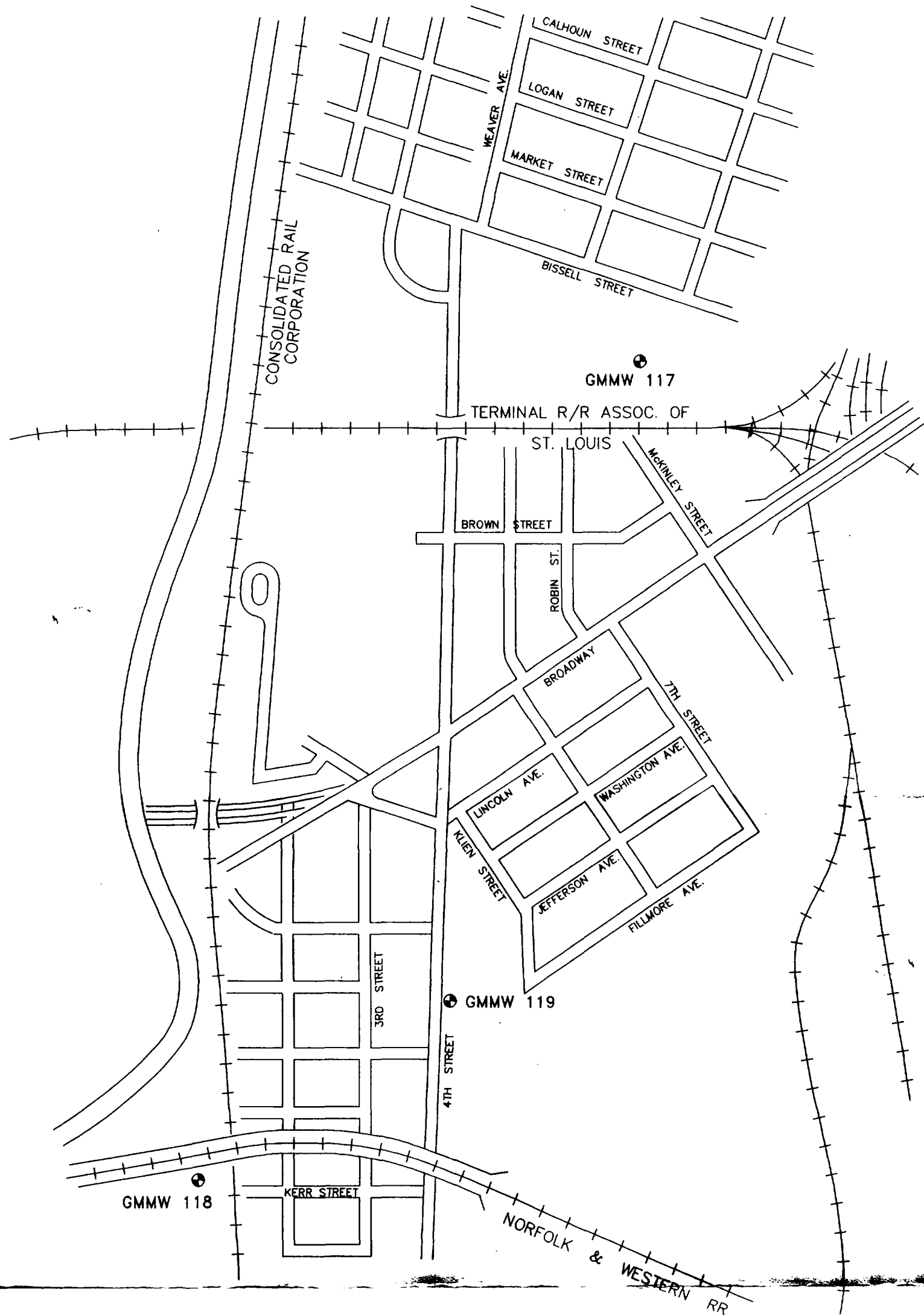
35 East Wacker Drive
Suite 1000, Chicago, Illinois 60601
Tel: 312/263-4700 Fax: 312/263-7887



EAGLE PARK ACRES
NEW MONITORING WELL LOCATIONS
PRE-DESIGN INVESTIGATION WORK PLAN
NL INDUSTRIES/TARACORP SUPERFUND SITE
GRANITE CITY, ILLINOIS

PROJECT NUMBER
C1003.002

FIGURE NUMBER
5



LEGEND

GMMW 117 ● PROPOSED SHALLOW MONITORING WELL/IDENTIFICATION

0 600

Scale in Feet

Basemap Source: Woodward-Clyde Consultants, Figure No. 1-7, February 14, 1994, Proj. No. C3M110.

ARCADIS GERAGHTY & MILLER

35 East Wacker Drive
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August 16, 2000

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H. KAMADA

CHECKED

A. TOKARSKI

PROJECT NUMBER

C1001003.0002

FIGURE NUMBER

6

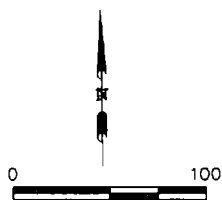
VENICE TOWNSHIP
NEW MONITORING WELL LOCATIONS
PRE-DESIGN INVESTIGATION WORK PLAN
NL INDUSTRIES/TARACORP SUPERFUND SITE
GRANITE CITY, ILLINOIS

Drwn By/Plot Scale: NEK/STF

Filename: OOCIO328.DWG

Project No.: C001003.0002

Date: 08/16/00



LEGEND

GMMW 123 MONITORING WELL LOCATION/IDENTIFICATION

ARCADIS GERAGHTY & MILLER

35 East Wacker Drive
Suite 1000, Chicago, Illinois 60601
Tel: 312/263-6703 Fax: 312/263-7897



MAIN INDUSTRIAL SITE
MONITORING WELL LOCATION GMMW 123
12TH STREET AND MADISON AVENUE
NL INDUSTRIES/TARACORP SUPERFUND SITE
GRANITE CITY, ILLINOIS

PROJECT NUMBER
CI1003.002

FIGURE NUMBER
7

APPENDIX D

**U.S. EPA Comments on the Draft Pre-Design Investigation Work Plan for Groundwater,
NL Industries/Taracorp Superfund Site, Granite City, Illinois
Correspondence from Sheri Bianchin and Brad Bradley of U.S. EPA Region 5
to Jeffrey Leed of Leed Environmental, Inc. dated October 25, 1999**



UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 5
77 WEST JACKSON BOULEVARD
CHICAGO, IL 60604-3590

REPLY TO THE ATTENTION OF

**VIA TELEFAX AND
REGULAR MAIL**

October 25, 1999

SR-6J

Mr. Jeffrey Leed
Leed Environmental, Inc.
124 Deborah Drive
Reading, PA 19610

RE: NL Industries/Taracorp Superfund Site, Granite City, IL

Dear Mr. Leed,

On behalf of the United States Environmental Protection Agency (U.S. EPA), we have reviewed the draft Pre-Design Investigation Work Plan for Groundwater at the NL Industries/Taracorp Superfund Site- Granite City, Illinois. This work plan is required by Consent Decree terms that all parties agreed to in order to determine the extent of groundwater contamination at the NL Industries/Taracorp Superfund Site, Granite City, Illinois.

Preliminary comments were issued by the U.S. EPA on September 20, 1999. In addition, comments were discussed in several conference calls which were held on October 1st and 7th, 1999. U.S. EPA hereby approves the work plan with the modifications contained in the enclosure to this letter. Please revise the work plan in accordance with these modifications, and send 4 copies of the amended work plan to us as soon as possible. Work can start immediately, irregardless of when we receive the modified documents. Please let us know when work will begin so that we may schedule the appropriate oversight.

If you have any questions, or require any clarification, please call me at (312) 886-4745.

Sincerely,

A handwritten signature in cursive script that reads "Brad Bradley, for".

Sheri L. Bianchin/Brad Bradley
Remedial Project Managers

Enclosures

cc: Charles Settles, U.S. ACE

Sandy Bron, IEPA

Jack Kratzmeyer, Arcadis Geraghty & Miller

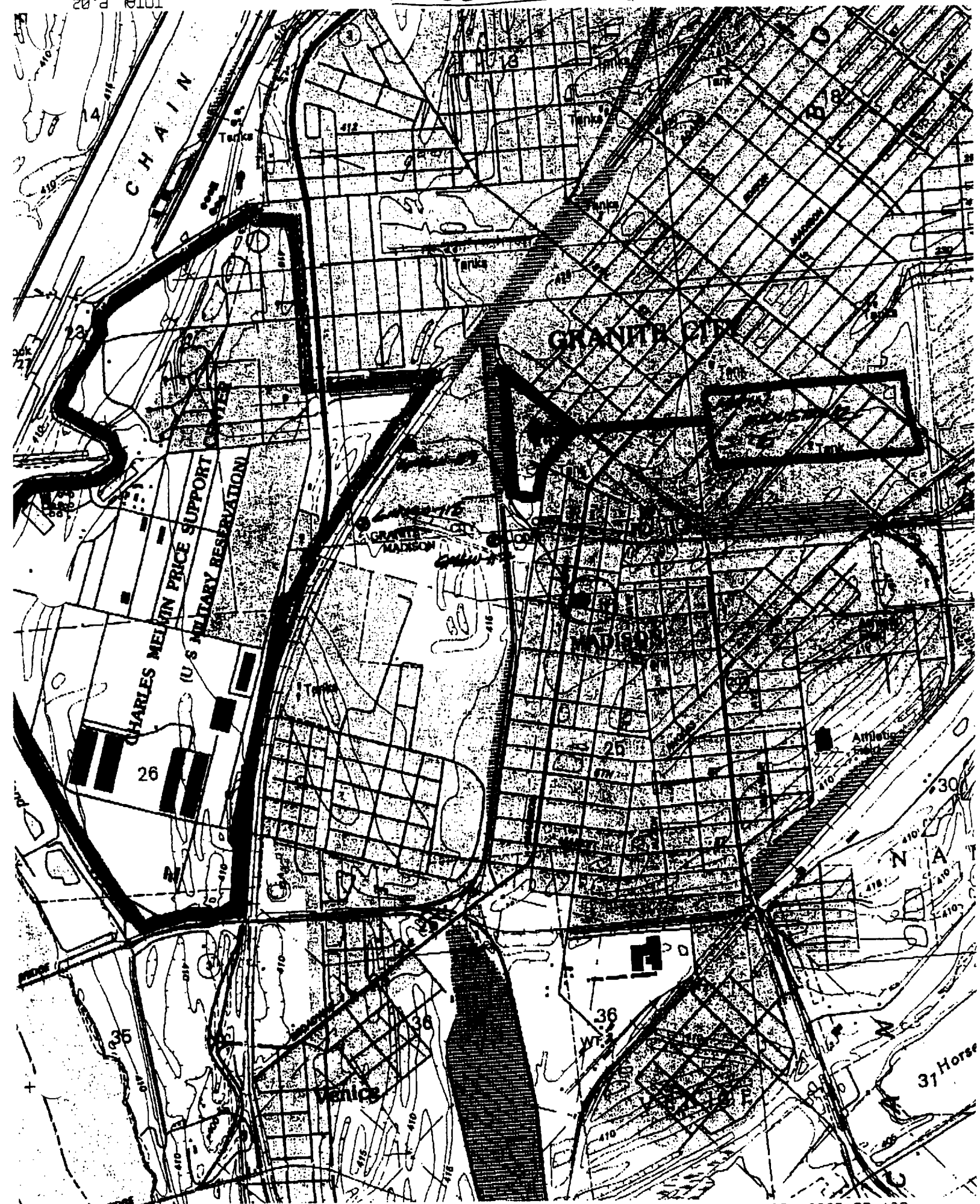
Nicholas Valkenburg, C.P.G., Arcadis Geraghty & Miller

Enclosure

U.S. EPA Modifications to the Draft Pre-Design Investigation Work Plan for Groundwater at the NL Industries/Taracorp Superfund Site- Granite City, Illinois

MODIFICATIONS

1. **Page 3/14, Section 2.2, U.S. EPA Selected Groundwater Remedy.** Delete "natural attenuation". The 1992 Decision Document/Explanation of Significant Differences (DD/ESD) does not address natural attenuation. This however does not preclude the collection of information to demonstrate whether "natural attenuation" is occurring. If that is a secondary purpose of collecting this information, then specify what information will be collected for that purpose and how this information will be used.
2. **Page 3/14, Section 2.2, U.S. EPA Selected Groundwater Remedy.** Replace "on" with "emanating from".
3. **Page 3/14, Section 2.2, U.S. EPA Selected Groundwater Remedy.** Delete "on-site".
4. **Page 5/14, Section 2.4, Nature and Extent of Impacted Groundwater.** Include summary tables of analytical results to date.
5. **Page 6/14, Section 2.4.1, Investigations Conducted by the IEPA, first paragraph.** Delete last sentence.
6. **Page 11/14, Section 3.5, Geochemical Modeling.** U.S. EPA shall review any models. It is not clear for what purpose the models are being used, given that the monitoring well network by itself should fulfill the goal of the pre-design activities, which is to delineate the extent of ground water contamination emanating from the NL Industries Site.
7. **Figure 2.** See Enclosure 1 for the new well locations, i.e. the additional wells that were agreed to in our previous conversations. Incorporate these changes into the Figure.
8. **Figure 3.** See Enclosure 2 for the new well locations. Incorporate these changes into the Figure.
9. **Figure 4.** See Enclosure 3 for the new well locations. Incorporate these changes in the Figure.
9. **Figure 5, Schedule.** Insert the correct figure into the report; i.e. the schedule that indicates that construction of the containment/ground water system will be completed by September 30, 2000.

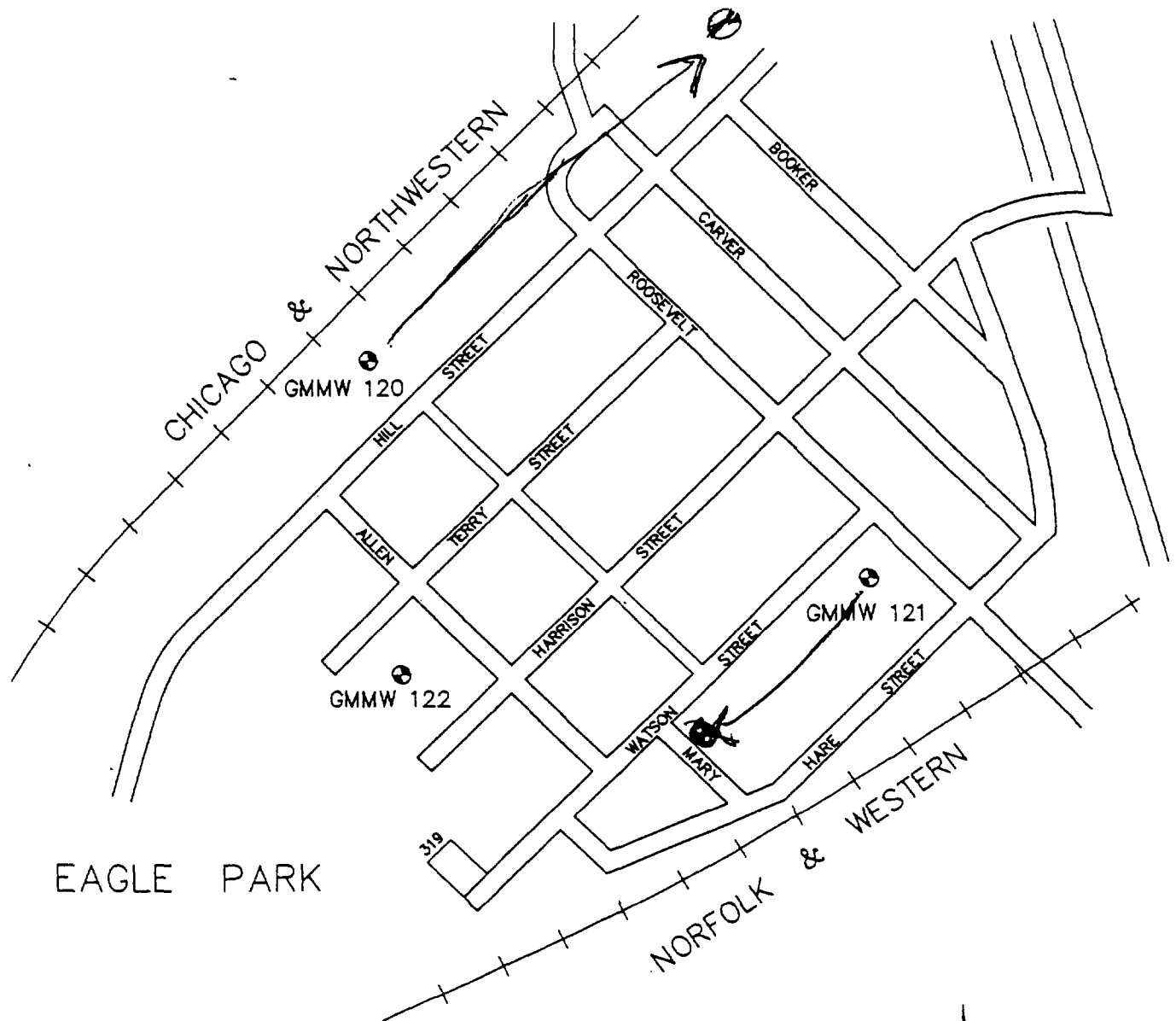


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Filename: 99C10367.DWG

Project No.: C1001003.0002/00001

Date: 8/19/99



LEGEND

- ⊗ PROPOSED SHALLOW MONITORING WELL/
IDENTIFICATION

0 500
Scale in Feet

Basemap Source: Woodward-Clyde Consultants,
Figure 1-6, June 1, 1994, Proj. No. C3M11Q.

ARCADIS GERAGHTY & MILLER

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EAGLE PARK
NEW MONITORING WELL LOCATIONS
PRE-DESIGN INVESTIGATION WORK PLAN
NL INDUSTRIES/TARACORP SUPERFUND SITE
GRANITE CITY, ILLINOIS

PROJECT NUMBER
C11003.002

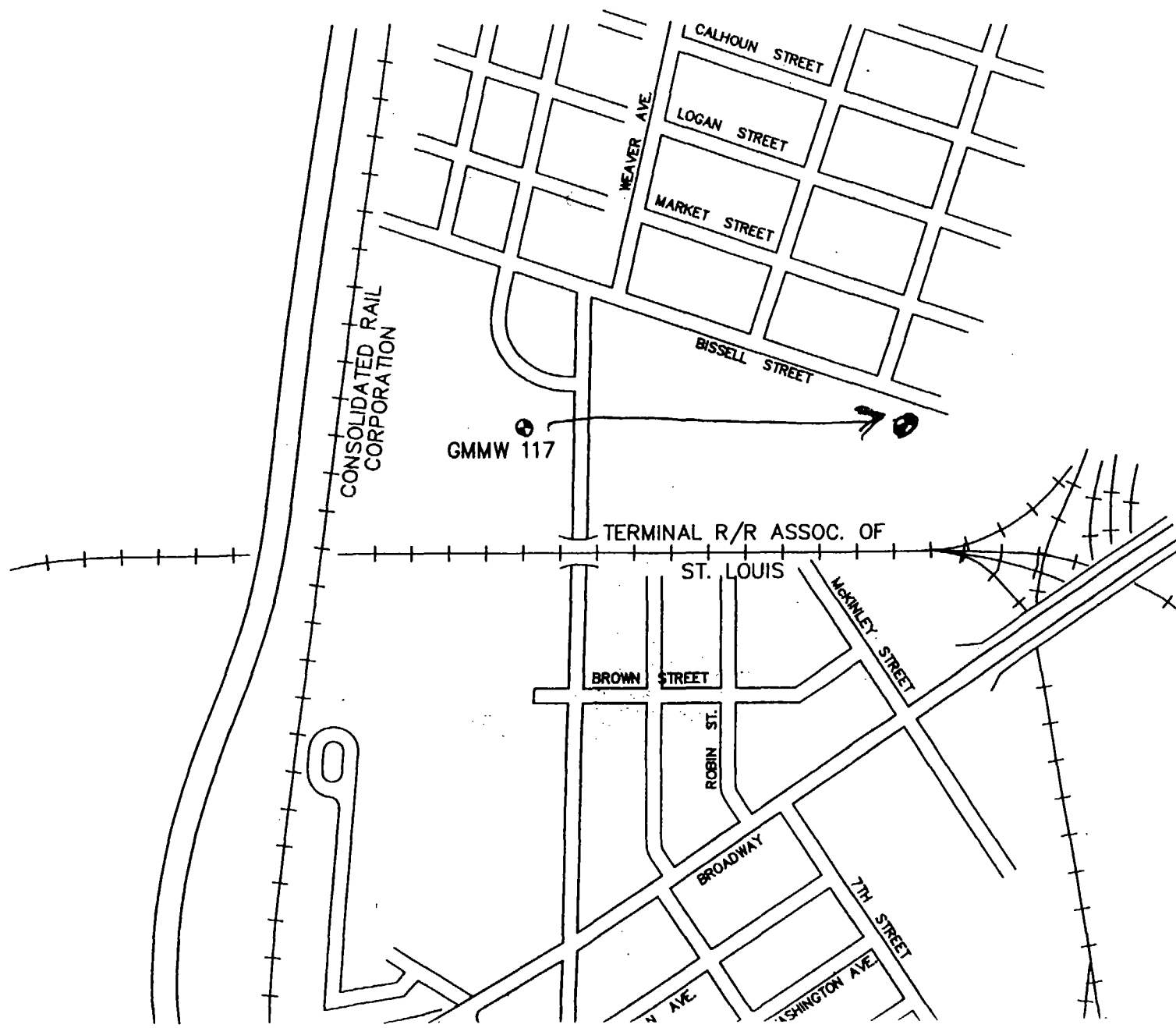
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3

Date: 9/7/99

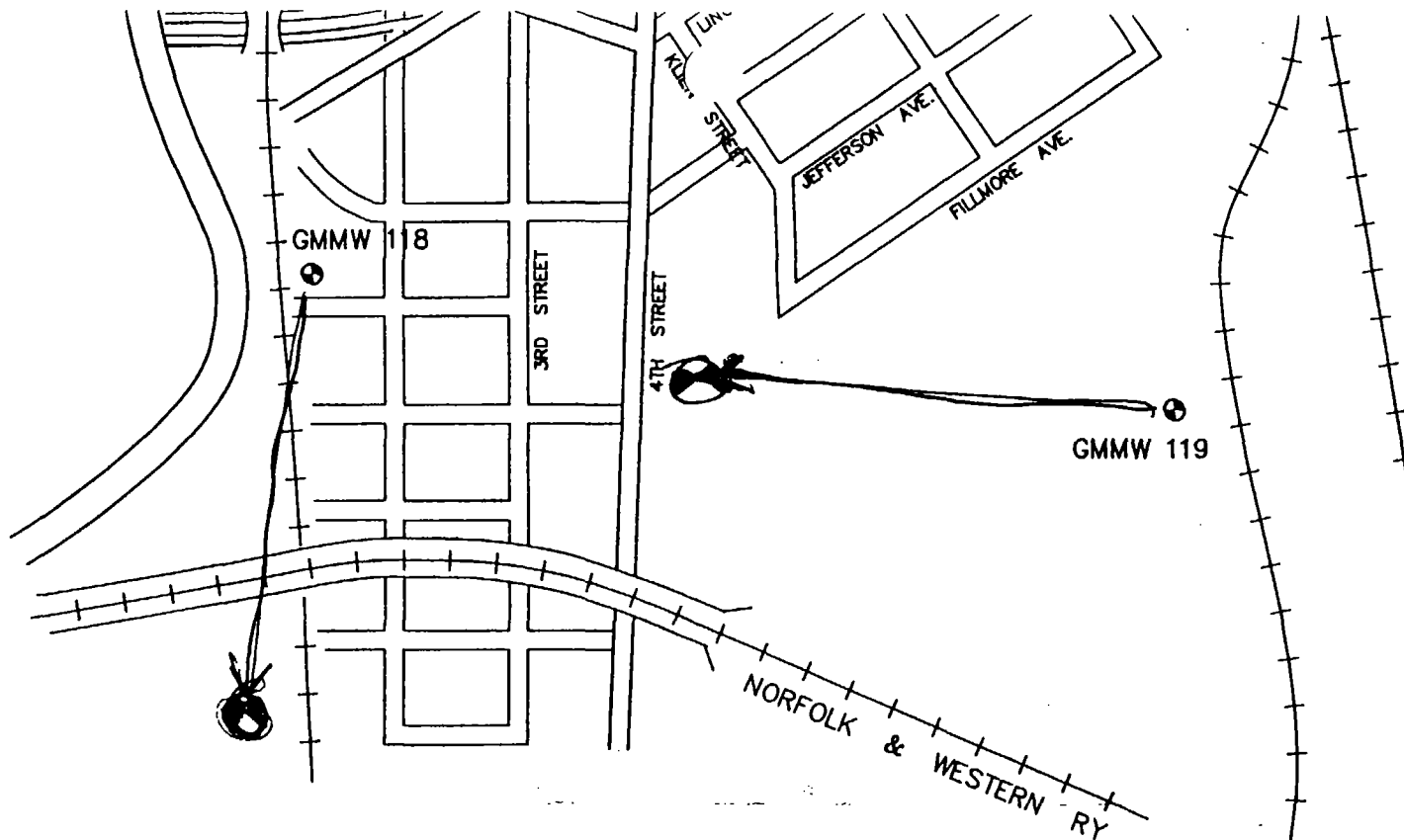
Project No.: C1001003.0002/00001

Filename: 99C10368.DWG

Drawn By/Plot Scale: SGoznar/1=600



Enclosure 3



LEGEND

⊕ PROPOSED SHALLOW MONITORING WELL/IDENTIFICATION

0 600

Scale in Feet

Basemap Source: Woodward-Clyde Consultants, Figure No. 1-7, February 14, 1994, Proj. No. C3M11Q.

ARCADIS GERAGHTY & MILLER



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DRAWN
SCHEER

DATE
September 7, 1999

PROJECT MANAGER
D HAMMOND

DEPARTMENT MANAGER
J KRATZMEYER

VENICE TOWNSHIP
NEW MONITORING WELL LOCATIONS
PRE-DESIGN INVESTIGATION WORK PLAN
NL INDUSTRIES/TARACORP SUPERFUND SITE
GRANITE CITY, ILLINOIS

LEAD DESIGN PROF.
SCHEER

CHECKED
D HAMMOND

PROJECT NUMBER
C1001003.0002

FIGURE NUMBER
4

Enclosure 3 - continued

ATTACHMENT 1

**Summary of Site Investigation Data
Remedial Investigation/Feasibility Study
NL Industries/Taracorp Superfund Site, Granite City, Illinois
O'Brien & Gere 1995**

Table 3-1. Monitoring Well Construction Details for Wells Associated with the Granite City Superfund Site Investigation, Granite City, Illinois.

Well No.	Installed By	Well Casing and Screen Diameter	Construction Material	Well Screen Length and Slot Size	Well Screen Gravel Pack	Well Depth
MW-101	Taracorp	2-inch	PVC	5 ft slot size NA	W-B 40 sand	22
MW-102	Taracorp	2-inch	PVC	5 ft slot size NA	W-B 40 sand	22
MW-103	Taracorp	2-inch	PVC	5 ft slot size NA	W-B 40 sand	22
MW-104	Taracorp	2-inch	PVC	5 ft slot size NA	W-B 40 sand	22
MW-105S	IEPA	2-inch	Schedule 40 PVC	5 ft No.10 slot	Silica sand	28
MW-105D	IEPA	2-inch	Schedule 40 PVC	5 ft No.10 slot	In-situ sand	35.3
MW-106S	IEPA	2-inch	Schedule 40 PVC	5 ft No.10 slot	Silica sand	20.79
MW-106D	IEPA	2-inch	Schedule 40 PVC	5 ft No.10 slot	In-situ sand	34.91
MW-107S	IEPA	2-inch	Schedule 40 PVC	5 ft No.10 slot	Silica sand	22.48
MW-107D	IEPA	2-inch	Schedule 40 PVC	5 ft No.10 slot	In-situ sand	35.44
MW-108S	IEPA	2-inch	Schedule 40 PVC	5 ft No.10 slot	In-situ sand	20.4
MW-108D	IEPA	2-inch	Schedule 40 PVC	5 ft No.10 slot	In-situ sand	32.28
MW-109	OBG	2-inch	PVC	5 ft No.10 slot	Sand	34
MW-110	OBG	2-inch	PVC	5 ft No.10 slot	Sand	35
MW-103-91	WWC	2-inch	Type 304 SS	10 ft No.10 slot	Colorado silica sand 16-30	71
MW-104-92	WWC	2-inch	Type 304 SS	10 ft No.10 slot	Colorado silica sand 20/40	70
MW-109-92	WWC	2-inch	Type 304 SS	10 ft No.10 slot	Colorado silica sand 20/40	70
MW-111-92	WWC	2-inch	Type 304 SS	10 ft No.10 slot	NA	NA

(a) In feet below grade.
 NA Information not available.
 PVC Poly vinyl chloride.
 IEPA Illinois Environmental Protection Agency.
 OBG O'Brien & Gere Engineers, Inc.
 WWC Woodward Clyde, Consultants.
 SS Stainless steel.

Table 3-2. Summary of Previous Groundwater Monitoring Events Conducted by O'Brien & Gere Engineers, Inc. at the Granite City Superfund Site, Granite City, Illinois.

Well No.	Dates Sampled	Filtered Metals Collected	Unfiltered Metals Collected
MW-101	January 1987	Y	N
	April 1987	Y	N
	August 1987	Y	N
	November 1987	Y	N
MW-102	January 1987	Y	Y
	April 1987	Y	Y
MW-103	January 1987	Y	N
	April 1987	Y	N
MW-104	January 1987	Y	N
	April 1987	Y	N
MW-105S	January 1987	Y	N
MW-105D	January 1987	Y	N
	April 1987	Y	N
MW-106S	January 1987	Y	N
MW-106D	January 1987	Y	N
	April 1987	Y	Y
MW-107S	January 1987	Y	N
	April 1987	Y	N
MW-107D	January 1987	Y	N
	April 1987	Y	N
	August 1987	Y	N
	November 1987	Y	N
MW-108S	January 1987	Y	Y
MW-108D	January 1987	Y	N
	April 1987	Y	Y
	August 1987	Y	Y
	November 1987	Y	Y
MW-109	January 1987	Y	N
	April 1987	Y	N
	August 1987	Y	N
	November 1987	Y	N
MW-110	January 1987	Y	N
	April 1987	Y	N
	August 1987	Y	N
	November 1987	Y	N

Y Yes.
N No.

Table 3-3. Concentrations of Metals, Sulfate, and Total Dissolved Solids Detected in Groundwater Samples Collected from Monitoring Wells During the Remedial Investigation, Granite City Superfund Site, Granite City, Illinois.

Parameter	Well: MW-101 Date: Jan-87	MW-101 Apr-87	MW-101 Aug-87	MW-101 Nov-87	MW-102 Jan-87	MW-102 Apr-87	MW-103 Jan-87	MW-103 Apr-87	MW-104 Jan-87	MW-104 Apr-87
Antimony, filtered	<0.02	<0.02	NA	NA	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Arsenic, filtered	0.077	0.070	0.101	0.071	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Barium, filtered	<1	<1	NA	NA	<1	<1	<1	<1	<1	<1
Cadmium, filtered	<0.001	<0.001	0.007	<0.001	<0.001	<0.001	<0.001	0.002	0.002	<0.001
Chromium, filtered	<0.005	<0.005	NA	NA	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Copper, filtered	<0.01	<0.01	NA	NA	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Iron, filtered	20	20	22	22	0.12	<0.1	<0.10	<0.1	<0.10	<0.1
Lead, filtered	0.008	<0.005	<0.005	<0.005	0.013	<0.005	<0.005	<0.005	<0.005	<0.005
Lead, total	NA	NA	NA	NA	0.88	0.28	NA	NA	NA	NA
Manganese, filtered	4.3	4.22	4.9	5.5	0.27	0.124	0.06	<0.025	0.03	0.028
Mercury, filtered	<0.0005	<0.0005	NA	NA	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
Nickel, filtered	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Selenium, filtered	<0.005	<0.002	NA	NA	<0.005	<0.002	<0.005	0.003	<0.005	0.003
Silver, filtered	<0.005	<0.005	NA	NA	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Zinc, filtered	<0.02	<0.05	0.10	0.02	<0.02	<0.05	<0.02	<0.05	<0.02	<0.05
Sulfate	150	180	160	170	120	210	210	170	120	130
Total dissolved solids	590	530	550	690	640	610	500	550	360	400

All concentrations in milligrams per liter (mg/L).

NA Not analyzed.

Table 3-3. Concentrations of Metals, Sulfate, and Total Dissolved Solids Detected in Groundwater Samples Collected from Monitoring Wells During the Remedial Investigation, Granite City Superfund Site, Granite City, Illinois.

Parameter	Well: MW-105S Date: Jan-87	MW-105D Jan-87	MW-105D Apr-87	MW-106S Jan-87	MW-106D Jan-87	MW-106D Apr-87	MW-107S Jan-87	MW-107S Apr-87	MW-107D Jan-87	MW-107D Apr-87
Antimony, filtered	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Arsenic, filtered	<0.005	<0.005	<0.005	<0.005	0.005	<0.005	<0.005	<0.005	0.011	0.014
Barium, filtered	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Cadmium, filtered	0.002	0.008	<0.001	0.013	0.008	0.002	0.001	<0.001	<0.001	<0.001
Chromium, filtered	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Copper, filtered	<0.01	<0.01	<0.01	<0.01	0.02	<0.01	<0.01	<0.01	<0.01	<0.01
Iron, filtered	<0.10	<0.10	<0.10	<0.10	<0.10	<0.1	<0.10	<0.1	7.7	8.1
Lead, filtered	<0.005	<0.005	<0.005	<0.005	0.011	0.013	<0.005	<0.005	<0.005	<0.005
Lead, total	NA	NA	NA	NA	0.50	0.72	NA	NA	NA	NA
Manganese, filtered	<0.025	0.19	0.284	0.08	0.08	0.359	0.07	0.139	0.43	0.422
Mercury, filtered	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
Nickel, filtered	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Selenium, filtered	<0.005	<0.005	<0.002	<0.005	<0.005	0.003	<0.005	<0.002	<0.005	<0.002
Silver, filtered	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Zinc, filtered	<0.02	0.03	<0.05	0.27	0.09	<0.05	<0.02	<0.05	NA	<0.05
Sulfate	320	140	180	290	180	260	260	300	540	550
Total dissolved solids	1000	880	820	1100	600	770	820	850	1370	1300

All concentrations in milligrams per liter (mg/L).

NA Not analyzed.

Table 3-3. Concentrations of Metals, Sulfate, and Total Dissolved Solids Detected in Groundwater Samples Collected from Monitoring Wells During the Remedial Investigation, Granite City Superfund Site, Granite City, Illinois.

Parameter	Well: MW-107D Date: Aug-87	MW-107D Nov-87	MW-108S Jan-87	MW-108D Jan-87	MW-108D Apr-87	MW-108D Aug-87	MW-108D Nov-87	MW-109 Aug-87	MW-109 Nov-87	MW-110 Aug-87
Antimony, filtered	NA	NA	<0.02	<0.02	<0.02	NA	NA	<0.02	<0.02	<0.02
Arsenic, filtered	<0.005	<0.005	<0.005	0.007	<0.005	0.007	<0.005	<0.005	<0.005	<0.005
Barium, filtered	NA	NA	<1	<1	<1	NA	NA	<1	<1	<1
Cadmium, filtered	<0.001	<0.001	0.209	3.3	5.2	6.9	<0.001	<0.001	<0.001	0.004
Copper, filtered	NA	NA	<0.01	<0.01	<0.01	NA	NA	0.01	<0.01	<0.01
Iron, filtered	5.6	5.8	<0.10	<0.10	<0.1	<0.10	<0.10	<0.10	0.4	<0.10
Lead, filtered	<0.005	<0.005	0.005	0.008	0.009	0.009	<0.005	<0.005	<0.005	<0.005
Lead, total	NA	NA	0.50	NA	0.22	NA	NA	0.007	<0.005	0.016
Manganese, filtered	0.40	0.37	13.1	18.1	29.4	25	29	0.11	0.28	1.0
Mercury, filtered	NA	NA	<0.0005	<0.0005	<0.0005	NA	NA	<0.0002	<0.0002	<0.0002
Nickel, filtered	<0.01	<0.01	0.20	0.50	0.70	0.94	0.81	<0.01	<0.01	0.02
Selenium, filtered	NA	NA	<0.005	<0.05	<0.002	NA	NA	<0.002	<0.002	<0.002
Silver, filtered	NA	NA	<0.005	<0.005	<0.005	NA	NA	<0.005	<0.005	<0.005
Zinc, filtered	<0.02	<0.02	0.04	37	44	44	44	<0.02	<0.02	0.02
Sulfate	490	480	1250	1560	1850	1800	1825	78	68	280
Total dissolved solids	1300	1232	3110	3860	4400	4600	4400	530	500	1000

All concentrations in milligrams per liter (mg/L).

NA Not analyzed.

Table 2-3. Concentrations of Metals, Sulfate, and Total Dissolved Solids Detected in Groundwater Samples Collected from Monitoring Wells During the Remedial Investigation, Granite City Superfund Site, Granite City, Illinois.

Well: MW-110	
Date: Nov-87	
Parameter	
Antimony, filtered	<0.02
Arsenic, filtered	<0.005
Barium, filtered	<1
Cadmium, filtered	<0.001
Chromium, filtered	<0.005
Copper, filtered	<0.01
Iron, filtered	<0.10
Lead, filtered	<0.005
Lead, total	<0.005
Manganese, filtered	0.99
Mercury, filtered	<0.0002
Nickel, filtered	0.01
Selenium, filtered	<0.002
Silver, filtered	<0.005
Zinc, filtered	<0.02
Sulfate	294
Total dissolved solids	1000

All concentrations in milligrams per liter (mg/L).

NA Not analyzed.

Table 3-4. Average Concentrations of Metals in Groundwater at the Granite City Superfund Site, Granite City, Illinois.

Constituents	MCL (mg/L)	IGQS (mg/L)	Low Flow Rate Sampling Technique (1993-1994)		All Sampling Events		Low Flow Technique (Total Analyses) and All Filtered Results	
			Average (mg/L)	Number	Average (mg/L)	Number	Average (mg/L)	Number
Arsenic, total	0.05	0.05	0.0285	79	0.0696	120	0.0172	176
Arsenic, filtered			0	27	0.0083	97		
Cadmium, total	0.005	0.005	0.5086	79	0.6533	120	0.6362	176
Cadmium, filtered			0.9381	27	0.4433	97		
Chromium, total	0.1	0.1	0.0275	79	0.0465	120	0.0141	170
Chromium, filtered			0.0005	27	0.0002	91		
Lead, total	0.015	0.0075	0.0237	79	0.0902	130	0.0191	176
Lead, filtered			0.0001	27	0.0051	97		
Nickel, total	0.1	0.1	0.0587	79	0.0881	120	0.0798	176
Nickel, filtered			0.0659	27	0.0555	97		
Zinc, total	5.0	5.0	2.0362	79	2.4393	120	3.5303	175
Zinc, filtered			3.5259	27	2.8681	96		

MCL Maximum Contaminant Level (USEPA).
 IGQS Illinois Groundwater Quality Standard.
 Mg/L Milligrams per liter.

ATTACHMENT 2

**Summary of Groundwater Sampling Results
Supplemental Groundwater Investigation
NL Industries/Taracorp Superfund Site, Granite City, Illinois
Woodward-Clyde Consultants 1995**

Table 1-5: Metals Results of
Historical Groundwater Sampling Events
NL/Paracorp Superfund Site

Parameter	Unit	MCLs (mg/L)	ILLINOIS CLASS I STANDARDS (mg/L)	MW-101						
				JULY 1992	OCTOBER 1992	MARCH 1993	SEPTEMBER 1993	APRIL 1994	JULY 1994	OCTOBER 1994
Antimony	mg/l	0.006	-	0.014 (1)	<0.011	<0.060	<0.050	<0.006	<0.006	<0.006
Antimony, filtered	mg/l	0.006	-					<0.006	<0.006	<0.006
Arsenic	mg/l	0.05	0.05	4.2 (3)	0.77 (3)	0.46 (3)	0.181 (3)	0.017	0.015	1.58 (1)
Arsenic, filtered	mg/l	0.05	0.05					<0.010	<0.010	<0.010
Beryllium	mg/l	0.004	-	0.0026	<0.0006	0.0006	<0.0015	<0.0004	<0.0004	<0.0004
Beryllium, filtered	mg/l	0.004	-					<0.0004	<0.0004	<0.0004
Cadmium	mg/l	0.005	0.005	0.0039	0.0053 (3)	<0.005	0.0006 (3)	<0.0015	<0.0015	0.0074 (1)
Cadmium, filtered	mg/l	0.005	0.005					<0.0015	<0.0015	<0.0015
Chromium	mg/l	0.1	0.1	0.034	0.018 (1)	0.077	0.0017	<0.010	0.011	0.051
Chromium, filtered	mg/l	0.1	0.1					<0.010	<0.010	<0.010
Copper	mg/l	1.3*	0.65	0.06	0.017	0.019	0.0001	0.0072	0.058	0.018
Copper, filtered	mg/l	1.3*	0.65					<0.0025	<0.0025	<0.0025
Lead	mg/l	0.015*	0.0075	0.130 (3)	0.021 (3)	0.027 (3)	0.0077 (1)	<0.0013	0.0004 (2)	0.0054 (1)
Lead, filtered	mg/l	0.015*	0.0075					<0.0013	<0.0013	<0.0013
Mercury	mg/l	0.002	0.002	0.0002	<0.0002	<0.0002	<0.00012	<0.00012	<0.00012	<0.00012
Mercury, filtered	mg/l	0.002	0.002					<0.00012	<0.00012	<0.00012
Nickel	mg/l	0.1	0.1	0.13 (3)	0.027	0.077	0.0072	<0.040	<0.040	0.154 (1)
Nickel, filtered	mg/l	0.1	0.1					<0.040	<0.040	<0.040
Selenium	mg/l	0.05	0.05	<0.003	<0.003	<0.003	0.0007	<0.0015	<0.0015	<0.0015
Selenium, filtered	mg/l	0.05	0.05					<0.0015	<0.0015	<0.0015
Silver	mg/l	-	0.05	<0.0004	<0.009	<0.009	<0.010	<0.010	<0.010	<0.010
Silver, filtered	mg/l	-	0.05					0.011	<0.010	<0.010
Thallium	mg/l	0.002	-	<0.002	<0.002	<0.002	<0.0050	<0.0002	0.0002	<0.0002
Thallium, filtered	mg/l	0.002	-					<0.0002	0.0002	0.0004 (1)
Zinc	mg/l	-	5.0	0.35	0.098	0.11	0.109	0.052	0.0004	0.246
Zinc, filtered	mg/l	-	5.0					<0.0020	<0.0020	<0.0020

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Table 1-5: Metals Results of
Historical Groundwater Sampling Events
NL/Taracorp Superfund Site

Parameter	Unit	MCLs (mg/L)	ILLINOIS CLASS I STANDARDS (mg/L)	MW-102			
				SEPTEMBER 1993	APRIL 1994	JULY 1994	OCTOBER 1994
Antimony	mg/l	0.006	-	<0.050	<0.006	<0.006	<0.006
Antimony, filtered	mg/l	0.006	-		<0.006	<0.006	<0.006
Arsenic	mg/l	0.05	0.05	0.015	<0.010	<0.010	<0.010
Arsenic, filtered	mg/l	0.05	0.05		<0.010	<0.010	<0.010
Beryllium	mg/l	0.004	-	<0.005	<0.004	<0.004	<0.004
Beryllium, filtered	mg/l	0.004	-		<0.004	<0.004	<0.004
Cadmium	mg/l	0.005	0.005	<0.005	<0.005	<0.005	<0.005
Cadmium, filtered	mg/l	0.005	0.005		<0.005	<0.005	<0.005
Chromium	mg/l	0.1	0.1	0.027	<0.010	<0.010	<0.010
Chromium, filtered	mg/l	0.1	0.1		<0.010	<0.010	<0.010
Copper	mg/l	1.3*	0.65	0.028	<0.025	0.036	<0.025
Copper, filtered	mg/l	1.3*	0.65		<0.025	<0.025	<0.025
Lead	mg/l	0.015*	0.0075	0.136 (3)	<0.003	<0.003	0.038 (3)
Lead, filtered	mg/l	0.015*	0.0075		<0.003	<0.003	<0.003
Mercury	mg/l	0.002	0.002	<0.0002	<0.0002	<0.0002	<0.0002
Mercury, filtered	mg/l	0.002	0.002		<0.0002	<0.0002	<0.0002
Nickel	mg/l	0.1	0.1	0.062	<0.040	<0.040	<0.040
Nickel, filtered	mg/l	0.1	0.1		<0.040	<0.040	<0.040
Selenium	mg/l	0.05	0.05	0.015	<0.005	<0.005	<0.005
Selenium, filtered	mg/l	0.05	0.05		<0.005	<0.005	<0.005
Silver	mg/l	-	0.05	<0.010	<0.010	<0.010	<0.010
Silver, filtered	mg/l	-	0.05		<0.010	<0.010	<0.010
Thallium	mg/l	0.002	-	<0.050	<0.002	<0.002	<0.002
Thallium, filtered	mg/l	0.002	-		<0.002	<0.002	<0.002
Zinc	mg/l	-	5.0	0.123	<0.020	0.071	0.028
Zinc, filtered	mg/l	-	5.0		<0.020	<0.020	<0.020

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**Table 1-5: Metals Results of
Historical Groundwater Sampling Events
NL/Taracorp Superfund Site**

Parameter	Unit	MCLs (mg/L)	ILLINOIS CLASS I STANDARDS (mg/L)	MW-103-91					
				JULY 1992	OCTOBER 1992	MARCH 1993	SEPTEMBER 1993	APRIL 1994	OCTOBER 1994
Antimony	mg/l	0.006	-	<0.002	0.014 (1)	<0.060	<0.050	<0.006	<0.006
Antimony, filtered	mg/l	0.006	-						
Arsenic	mg/l	0.05	0.05	<0.003	<0.003	<0.003	<0.010	<0.010	<0.010
Arsenic, filtered	mg/l	0.05	0.05						
Beryllium	mg/l	0.004	-	<0.0006	<0.0006	<0.0006	<0.005	<0.004	<0.004
Beryllium, filtered	mg/l	0.004	-						
Cadmium	mg/l	0.005	0.005	0.0017	<0.005	<0.005	<0.005	0.005	<0.005
Cadmium, filtered	mg/l	0.005	0.005						
Chromium	mg/l	0.1	0.1	<0.002	0.029 U	<0.013	<0.010	<0.010	<0.010
Chromium, filtered	mg/l	0.1	0.1						
Copper	mg/l	1.3*	0.65	<0.014	<0.014	<0.014	<0.025	<0.025	<0.025
Copper, filtered	mg/l	1.3*	0.65						
Lead	mg/l	0.015*	0.0075	0.0027	0.0038	<0.002	<0.003	<0.003	<0.003
Lead, filtered	mg/l	0.015*	0.0075						
Mercury	mg/l	0.002	0.002	0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Mercury, filtered	mg/l	0.002	0.002						
Nickel	mg/l	0.1	0.1	<0.023	<0.023	<0.023	<0.040	<0.040	<0.040
Nickel, filtered	mg/l	0.1	0.1						
Selenium	mg/l	0.05	0.05	<0.003	<0.003	<0.003	<0.005	<0.005	<0.005
Selenium, filtered	mg/l	0.05	0.05						
Silver	mg/l	-	0.05	<0.0004	<0.009	<0.009	<0.010	0.012	<0.010
Silver, filtered	mg/l	-	0.05						
Thallium	mg/l	0.002	-	<0.002	<0.002	<0.002	<0.050	<0.002	<0.002
Thallium, filtered	mg/l	0.002	-						
Zinc	mg/l	-	5.0	0.036	0.074 J	<0.020	<0.020	<0.020	<0.020
Zinc, filtered	mg/l	-	5.0						

Woodward-Clyde

**Table 1-5: Metals Results of
Historical Groundwater Sampling Events
NL/Taracorp Superfund Site**

Parameter	Unit	MCLs (mg/L)	ILLINOIS CLASS I STANDARDS (mg/L)	MW-104						
				JULY 1992	OCTOBER 1992	MARCH 1993	SEPTEMBER 1991	APRIL 1994	JULY 1994	OCTOBER 1994
Antimony	mg/l	0.006	-	0.023 (1)	0.013 (1)	<0.060	<0.050	<0.006	<0.006	<0.006
Antimony, filtered	mg/l	0.006	-					<0.006	<0.006	<0.006
Arsenic	mg/l	0.05	0.05	0.086 (3)	0.087 (3)	0.0046	0.018	<0.010	<0.010	<0.010
Arsenic, filtered	mg/l	0.05	0.05					<0.010	<0.010	<0.010
Beryllium	mg/l	0.004	-	0.0019	0.00322	<0.0006	<0.005	<0.004	<0.004	<0.004
Beryllium, filtered	mg/l	0.004	-					<0.004	<0.004	<0.004
Cadmium	mg/l	0.005	0.005	0.0027	<0.005	<0.005	0.005 (3)	0.006 (3)	<0.005	<0.005
Cadmium, filtered	mg/l	0.005	0.005					<0.005	<0.005	<0.005
Chromium	mg/l	0.1	0.1	0.047	0.098 J	<0.013	0.035	<0.010	0.015	0.019
Chromium, filtered	mg/l	0.1	0.1					<0.010	<0.010	<0.010
Copper	mg/l	1.3*	0.65	0.064	0.097	<0.014	<0.025	<0.025	<0.025	<0.025
Copper, filtered	mg/l	1.3*	0.65					<0.025	<0.025	<0.025
Lead	mg/l	0.015*	0.0075	0.47 (3)	0.42 (3)	0.013 (2)	0.043 (3)	0.019 (3)	0.032 (3)	0.091 (3)
Lead, filtered	mg/l	0.015*	0.0075					<0.003	<0.003	<0.003
Mercury	mg/l	0.002	0.002	0.0003	0.0005	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Mercury, filtered	mg/l	0.002	0.002					<0.0002	<0.0002	<0.0002
Nickel	mg/l	0.1	0.1	0.12 (3)	0.19 (3)	<0.023	0.047	<0.040	<0.040	0.052
Nickel, filtered	mg/l	0.1	0.1					<0.040	<0.040	<0.040
Selenium	mg/l	0.05	0.05	<0.003	<0.003	<0.003	<0.005	<0.005	<0.005	<0.005
Selenium, filtered	mg/l	0.05	0.05					<0.005	<0.005	<0.005
Silver	mg/l	-	0.05	<0.0004	<0.009	<0.009	<0.010	<0.010	<0.010	<0.010
Silver, filtered	mg/l	-	0.05					<0.010	<0.010	<0.010
Thallium	mg/l	0.002	-	<0.002	<0.002	<0.002	<0.050	<0.002	<0.002	<0.002
Thallium, filtered	mg/l	0.002	-					<0.002	<0.002	<0.002
Zinc	mg/l	-	5.0	0.24	0.38 J	<0.020	0.072	<0.020	0.040	0.050
Zinc, filtered	mg/l	-	5.0					<0.020	<0.020	<0.020

Woodward-Clyde

**Table 1-5: Metals Results of
Historical Groundwater Sampling Events
NL/Taracorp Superfund Site**

Parameter	Unit	MCLs (mg/L)	ILLINOIS CLASS I STANDARDS (mg/L)	MW-104-92						
				JULY 1992	OCTOBER 1992	MARCH 1993	SEPTEMBER 1993	APRIL 1994	JULY 1994	OCTOBER 1994
Antimony	mg/l	0.006	-	0.007 (1)	0.01 (1)	<0.060	<0.050	<0.006	<0.006	<0.006
Antimony, filtered	mg/l	0.006	-					<0.006	<0.006	<0.006
Arsenic	mg/l	0.05	0.05	0.0088	0.0032	<0.003	<0.010	<0.010	<0.010	<0.010
Arsenic, filtered	mg/l	0.05	0.05					<0.010	<0.010	<0.010
Beryllium	mg/l	0.004	-	<0.0006	<0.0006	<0.0006	<0.005	<0.004	<0.004	<0.004
Beryllium, filtered	mg/l	0.004	-					<0.004	<0.004	<0.004
Cadmium	mg/l	0.005	0.005	0.0033	<0.005	<0.005	0.005 (3)	<0.005	<0.005	<0.005
Cadmium, filtered	mg/l	0.005	0.005					<0.005	<0.005	<0.005
Chromium	mg/l	0.1	0.1	0.002	0.034 J	<0.013	<0.010	<0.010	<0.010	<0.010
Chromium, filtered	mg/l	0.1	0.1					<0.010	<0.010	<0.010
Copper	mg/l	1.3*	0.65	<0.014	<0.014	<0.014	<0.025	<0.025	<0.025	0.047
Copper, filtered	mg/l	1.3*	0.65					<0.025	<0.025	<0.025
Lead	mg/l	0.015*	0.0075	0.44 (3)	0.27 (3)	0.043 (3)	0.520/0.480 (3)	0.036 (3)	0.054 (3)	0.094 (3)
Lead, filtered	mg/l	0.015*	0.0075					<0.003	<0.003	<0.003
Mercury	mg/l	0.002	0.002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Mercury, filtered	mg/l	0.002	0.002					<0.0002	<0.0002	<0.0002
Nickel	mg/l	0.1	0.1	<0.023	<0.023	<0.023	<0.040	<0.040	<0.040	<0.040
Nickel, filtered	mg/l	0.1	0.1					<0.040	<0.040	<0.040
Selenium	mg/l	0.05	0.05	<0.003	<0.003	<0.003	<0.005	<0.005	<0.005	<0.005
Selenium, filtered	mg/l	0.05	0.05					<0.005	<0.005	<0.005
Silver	mg/l	-	0.05	<0.0004	<0.009	<0.009	<0.010	<0.010	<0.010	<0.010
Silver, filtered	mg/l	-	0.05					<0.010	<0.010	<0.010
Thallium	mg/l	0.002	-	<0.002	<0.002	<0.002	<0.050	<0.002	<0.002	<0.002
Thallium, filtered	mg/l	0.002	-					<0.002	<0.002	<0.002
Zinc	mg/l	-	5.0	0.082	0.066 J	<0.020	0.037	<0.020	0.020	<0.020
Zinc, filtered	mg/l	-	5.0					<0.020	<0.020	<0.020

Woodward-Clyde

**Table 1-5: Metals Results of
Historical Groundwater Sampling Events
NL/Taracorp Superfund Site**

Parameter	Unit	MCLs (mg/L)	ILLINOIS CLASS I STANDARDS (mg/L)	MW-1055				MW-1065		
				SEPTEMBER 1991	APRIL 1994	JULY 1994	OCTOBER 1994	SEPTEMBER 1991	APRIL 1994	JULY 1994
Antimony	mg/l	0.006	-	<0.050	<0.006	<0.006	<0.006	<0.050	0.008 (1)	<0.006
Antimony, filtered	mg/l	0.006	-		<0.006	<0.006			<0.006	<0.006
Arsenic	mg/l	0.05	0.05	<0.010	<0.010	<0.010	0.029	0.014	0.081 (3)	0.043
Arsenic, filtered	mg/l	0.05	0.05		<0.010	<0.010			<0.010	<0.010
Beryllium	mg/l	0.004	-	<0.005	<0.004	<0.004	<0.004	<0.005	0.007 (1)	0.004 (1)
Beryllium, filtered	mg/l	0.004	-		<0.004	<0.004			<0.004	<0.004
Cadmium	mg/l	0.005	0.005	<0.005	<0.005	<0.005	0.017 (3)	<0.005	0.005	0.004 (3)
Cadmium, filtered	mg/l	0.005	0.005		<0.005	<0.005			<0.005	<0.005
Chromium	mg/l	0.1	0.1	0.029	<0.010	0.026	0.118 (3)	0.476 (3)	0.183 (3)	0.137 (3)
Chromium, filtered	mg/l	0.1	0.1		<0.010	<0.010			<0.010	<0.010
Copper	mg/l	1.3*	0.65	<0.025	<0.025	<0.025	0.055	0.056	0.179	0.16
Copper, filtered	mg/l	1.3*	0.65		<0.025	<0.025			<0.025	<0.025
Lead	mg/l	0.015*	0.0075	0.015 (3)	0.008 (2)	0.035 (3)	0.149 (3)	0.143 (3)	0.776 (3)	0.269 (3)
Lead, filtered	mg/l	0.015*	0.0075		<0.003	<0.003			<0.003	<0.003
Mercury	mg/l	0.002	0.002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	0.0006 (3)	0.0001
Mercury, filtered	mg/l	0.002	0.002		<0.0002	<0.0002			<0.0002	<0.0002
Nickel	mg/l	0.1	0.1	<0.040	<0.040	<0.040	0.122 (3)	0.366 (3)	0.22 (3)	0.208 (3)
Nickel, filtered	mg/l	0.1	0.1		<0.040	<0.040			<0.040	<0.040
Selenium	mg/l	0.05	0.05	0.016	0.011	<0.005	<0.005	0.011	<0.005	<0.005
Selenium, filtered	mg/l	0.05	0.05		0.014	<0.005			<0.005	<0.005
Silver	mg/l	-	0.05	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Silver, filtered	mg/l	-	0.05		<0.010	<0.010			<0.010	<0.010
Thallium	mg/l	0.002	-	<0.050	<0.002	<0.002	<0.002	<0.050	0.003 (1)	0.003 (1)
Thallium, filtered	mg/l	0.002	-		<0.002	<0.002			<0.002	<0.002
Zinc	mg/l	-	5.0	0.039	<0.020	0.045	0.360	0.181	0.876	0.671
Zinc, filtered	mg/l	-	5.0		<0.020	<0.020			<0.020	0.023

Woodward-Clyde

**Table 1-5: Metals Results of
Historical Groundwater Sampling Events
NL/Taracorp Superfund Site**

Parameter	Unit	MCLs (mg/L)	ILLINOIS CLASS I STANDARDS (mg/L)	MW-106D						
				JULY 1992	OCTOBER 1992	MARCH 1993	SEPTEMBER 1993	APRIL 1994	JULY 1994	OCTOBER 1994
Antimony	mg/l	0.006	-	0.003	<0.011	<0.060	<0.050	<0.006	<0.006	<0.006
Antimony, filtered	mg/l	0.006	-					<0.006	<0.006	<0.006
Arsenic	mg/l	0.05	0.05	0.013	0.0032	<0.003	<0.010	<0.010	<0.010	<0.010
Arsenic, filtered	mg/l	0.05	0.05					<0.010	<0.010	<0.010
Beryllium	mg/l	0.004	-	<0.0006	<0.0006	<0.0006	<0.005	<0.004	<0.004	<0.004
Beryllium, filtered	mg/l	0.004	-					<0.004	<0.004	<0.004
Cadmium	mg/l	0.005	0.005	0.0005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Cadmium, filtered	mg/l	0.005	0.005					<0.005	<0.005	<0.005
Chromium	mg/l	0.1	0.1	<0.002	0.015 U	<0.013	0.019	<0.010	<0.010	<0.010
Chromium, filtered	mg/l	0.1	0.1					<0.010	<0.010	<0.010
Copper	mg/l	1.3*	0.65	<0.014	<0.014	<0.014	<0.025	<0.025	0.063	<0.025
Copper, filtered	mg/l	1.3*	0.65					<0.025	<0.025	<0.025
Lead	mg/l	0.015*	0.0075	0.019 (3)	0.019 (3)	<0.002	<0.003	<0.003	0.012 (2)	<0.003
Lead, filtered	mg/l	0.015*	0.0075					<0.003	<0.003	<0.003
Mercury	mg/l	0.002	0.002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Mercury, filtered	mg/l	0.002	0.002					<0.0002	<0.0002	<0.0002
Nickel	mg/l	0.1	0.1	<0.023	0.026	<0.023	<0.040	<0.040	<0.040	<0.040
Nickel, filtered	mg/l	0.1	0.1					<0.040	<0.040	<0.040
Selenium	mg/l	0.05	0.05	0.0077	0.01	0.0098	0.013	0.005 J	0.000	0.000
Selenium, filtered	mg/l	0.05	0.05					0.006	0.000	0.000
Silver	mg/l	-	0.05	<0.0004	<0.009	<0.009	<0.010	<0.010	<0.010	<0.010
Silver, filtered	mg/l	-	0.05					<0.010	<0.010	<0.010
Thallium	mg/l	0.002	-	<0.002	<0.002	<0.002	<0.050	<0.002	<0.002	<0.002
Thallium, filtered	mg/l	0.002	-					<0.002	<0.002	<0.002
Zinc	mg/l	-	5.0	<0.020	0.067	<0.020	<0.020	0.026	0.041	<0.020
Zinc, filtered	mg/l	-	5.0					<0.020	<0.020	<0.020

Woodward-Clyde

**Table 1-5: Metals Results of
Historical Groundwater Sampling Events
NL/Taracorp Superfund Site**

Parameter	Unit	MCLs (mg/l.)	ILLINOIS CLASS I STANDARDS (mg/l.)	MW-107S						
				JULY 1992	OCTOBER 1992	MARCH 1993	SEPTEMBER 1993	APRIL 1994	JULY 1994	OCTOBER 1994
Antimony	mg/l	0.006	-	0.008 (1)	<0.011	<0.060	<0.050	<0.006	<0.006	<0.006
Antimony, filtered	mg/l	0.006	-					<0.006	<0.006	<0.006
Arsenic	mg/l	0.05	0.05	0.044	0.10 (3)	0.026	<0.010	<0.010	0.032	0.022 (3)
Arsenic, filtered	mg/l	0.05	0.05					<0.010	<0.010	<0.010
Beryllium	mg/l	0.004	-	0.002	0.0079 (1)	0.0019	<0.005	<0.004	<0.004	0.004 (1)
Beryllium, filtered	mg/l	0.004	-					<0.004	<0.004	<0.004
Cadmium	mg/l	0.005	0.005	0.0032	0.010 (3)	<0.005	<0.005	<0.005	0.004 (3)	0.022 (3)
Cadmium, filtered	mg/l	0.005	0.005					<0.005	<0.005	<0.005
Chromium	mg/l	0.1	0.1	0.042	0.35 (3)	0.061	0.014	0.017	0.270 (3)	0.142 (3)
Chromium, filtered	mg/l	0.1	0.1					<0.010	<0.010	<0.010
Copper	mg/l	1.3*	0.65	0.064	0.3	0.066	<0.025	<0.025	0.116	0.222
Copper, filtered	mg/l	1.3*	0.65					<0.025	<0.025	<0.025
Lead	mg/l	0.015*	0.0075	0.14 (3)	0.52 (3)	0.087 (3)	0.047 (3)	0.007	0.077 (3)	0.176 (3)
Lead, filtered	mg/l	0.015*	0.0075					<0.003	<0.003	<0.003
Mercury	mg/l	0.002	0.002	<0.0002	0.0006	<0.0002	<0.0002	<0.0002	0.0018	0.0004
Mercury, filtered	mg/l	0.002	0.002					<0.0002	0.0015	<0.0002
Nickel	mg/l	0.1	0.1	0.11 (3)	0.43 (3)	0.092	<0.040	<0.040	0.257 (3)	0.280 (3)
Nickel, filtered	mg/l	0.1	0.1					<0.040	<0.040	<0.040
Selenium	mg/l	0.05	0.05	<0.003	<0.003	<0.003	0.011	<0.005	<0.005	0.010
Selenium, filtered	mg/l	0.05	0.05					<0.005	0.006	<0.005
Silver	mg/l	-	0.05	<0.0004	<0.009	<0.009	<0.010	<0.010	<0.010	<0.010
Silver, filtered	mg/l	-	0.05					<0.010	<0.010	<0.010
Thallium	mg/l	0.002	-	<0.002	<0.002	<0.002	<0.050	<0.002	<0.002	<0.002
Thallium, filtered	mg/l	0.002	-					<0.002	<0.002	0.003 (1)
Zinc	mg/l	-	5.0	0.25	0.86	0.18	0.084	0.041	0.282	0.59
Zinc, filtered	mg/l	-	5.0					<0.020	<0.020	<0.020

Woodward-Clyde

**Table 1-5: Metals Results of
Historical Groundwater Sampling Events
NL/Taracorp Superfund Site**

Parameter	Unit	MCLs (mg/L)	ILLINOIS CLASS I STANDARDS (mg/L)	MW-107D						
				JULY 1992	OCTOBER 1992	MARCH 1993	SEPTEMBER 1993	APRIL 1994	JULY 1994	OCTOBER 1994
Antimony	mg/l	0.006	-	0.005	<0.011	<0.060	<0.050	<0.006	<0.006 (1)	<0.006
Antimony, filtered	mg/l	0.006	-					<0.006	<0.006	<0.006
Arsenic	mg/l	0.05	0.05	0.065 (3)	0.04	0.024	<0.010	<0.010	<0.010	<0.010
Arsenic, filtered	mg/l	0.05	0.05					<0.010	<0.010	<0.010
Beryllium	mg/l	0.004	-	0.0016	0.0017	0.0006	<0.005	<0.004	<0.004	<0.004
Beryllium, filtered	mg/l	0.004	-					<0.004	<0.004	<0.004
Cadmium	mg/l	0.005	0.005	0.0018	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Cadmium, filtered	mg/l	0.005	0.005					<0.005	<0.005	<0.005
Chromium	mg/l	0.1	0.1	0.044	0.067 J	0.078	0.076	<0.010	0.114 (3)	0.114 (3)
Chromium, filtered	mg/l	0.1	0.1					<0.010	<0.010	<0.010
Copper	mg/l	1.3	0.65	0.052	0.054	0.027	<0.025	<0.025	<0.025	0.100
Copper, filtered	mg/l	1.3*	0.65					<0.025	<0.025	<0.025
Lead	mg/l	0.015*	0.0075	0.11 (3)	0.12 (3)	0.067 (3)	<0.003	<0.003	0.000	0.015 (2)
Lead, filtered	mg/l	0.015*	0.0075					<0.003	<0.003	<0.003
Mercury	mg/l	0.002	0.002	<0.0002	0.0002	<0.0002	<0.0002	<0.0002	0.0001 (1)	<0.0002
Mercury, filtered	mg/l	0.002	0.002					<0.0002	0.0006	<0.0002
Nickel	mg/l	0.1	0.1	0.054	0.057	0.045	<0.040	<0.040	0.092	0.040
Nickel, filtered	mg/l	0.1	0.1					<0.040	<0.040	<0.040
Selenium	mg/l	0.05	0.05	<0.003	<0.003	<0.003	<0.005	<0.005	<0.005 (1)	<0.005
Selenium, filtered	mg/l	0.05	0.05					<0.005	<0.005	<0.005
Silver	mg/l	-	0.05	<0.0004	<0.009	<0.009	<0.010	<0.010	<0.010 (1)	<0.010 (1)
Silver, filtered	mg/l	-	0.05					<0.010	<0.010	<0.010
Thallium	mg/l	0.002	-	<0.002	<0.002	<0.002	<0.050	<0.002	<0.002	<0.002
Thallium, filtered	mg/l	0.002	-					<0.002	<0.002	<0.002
Zinc	mg/l	-	5.0	0.22	0.25	0.091	0.05	<0.020	0.042	0.054
Zinc, filtered	mg/l	-	5.0					<0.020	<0.020	<0.020

Woodward-Clyde

**Table 1-5: Metals Results of
Historical Groundwater Sampling Events
NL/Taracorp Superfund Site**

Parameter	Unit	MCLs (mg/L)	ILLINOIS CLASS I STANDARDS (mg/L)	MW-107D QC FIELD DUPLICATE		
				APRIL 1994	JULY 1994	OCTOBER 1994
Antimony	mg/l	0.006	-	<0.006	<0.006	<0.006
Antimony, filtered	mg/l	0.006	-	<0.006	<0.006	<0.006
Arsenic	mg/l	0.05	0.05	<0.010	<0.010	<0.010
Arsenic, filtered	mg/l	0.05	0.05	<0.010	<0.010	<0.010
Beryllium	mg/l	0.004	-	<0.004	<0.004	<0.004
Beryllium, filtered	mg/l	0.004	-	<0.004	<0.004	<0.004
Cadmium	mg/l	0.005	0.005	<0.005	<0.005	0.006(3)
Cadmium, filtered	mg/l	0.005	0.005	<0.005	<0.005	<0.005
Chromium	mg/l	0.1	0.1	<0.010	0.158(3)	0.062
Chromium, filtered	mg/l	0.1	0.1	<0.010	<0.010	<0.010
Copper	mg/l	1.3*	0.65	<0.025	<0.025	0.253
Copper, filtered	mg/l	1.3*	0.65	<0.025	<0.025	<0.025
Lead	mg/l	0.015*	0.0075	<0.003	0.006	0.093(3)
Lead, filtered	mg/l	0.015*	0.0075	<0.003	<0.003	<0.003
Mercury	mg/l	0.002	0.002	<0.0002	0.0012	<0.0002
Mercury, filtered	mg/l	0.002	0.002	<0.0002	<0.0002	<0.0002
Nickel	mg/l	0.1	0.1	<0.040	0.116(3)	0.067
Nickel, filtered	mg/l	0.1	0.1	<0.040	<0.040	<0.040
Selenium	mg/l	0.05	0.05	<0.005	<0.005	<0.005
Selenium, filtered	mg/l	0.05	0.05	<0.005	<0.005	<0.005
Silver	mg/l	-	0.05	<0.010	<0.010	<0.010
Silver, filtered	mg/l	-	0.05	<0.010	<0.010	<0.010
Thallium	mg/l	0.002	-	<0.002	<0.002	<0.002
Thallium, filtered	mg/l	0.002	-	<0.002	<0.002	<0.002
Zinc	mg/l	-	5.0	<0.020	0.032	0.189
Zinc, filtered	mg/l	-	5.0	<0.020	<0.020	<0.020

Woodward-Clyde

Table 1-5: Metals Results of
Historical Groundwater Sampling Events
NL/Taracorp Superfund Site

Parameter	Unit	MCLs (mg/l.)	ILLINOIS CLASS I STANDARDS (mg/l.)	MW-108S			
				SEPTEMBER 1993	APRIL 1994	JULY 1994	OCTOBER 1994
Antimony	mg/l	0.006	-	<0.050	0.007 (1)	<0.006	0.011(1)
Antimony, filtered	mg/l	0.006	-		<0.006	<0.006	<0.006
Arsenic	mg/l	0.05	0.05	0.109 (3)	0.017	0.025	0.091(3)
Arsenic, filtered	mg/l	0.05	0.05		<0.010	<0.010	<0.010
Beryllium	mg/l	0.004	-	<0.005	<0.004	<0.004	<0.004
Beryllium, filtered	mg/l	0.004	-		<0.004	<0.004	<0.004
Cadmium	mg/l	0.005	0.005	0.475 (3)	0.180 (3)	0.225(3)	0.963(3)
Cadmium, filtered	mg/l	0.005	0.005		0.144 (3)	0.123(3)	0.368(3)
Chromium	mg/l	0.1	0.1	0.082	0.043	1.35(3)	0.318(3)
Chromium, filtered	mg/l	0.1	0.1		<0.010	<0.010	<0.010
Copper	mg/l	1.3*	0.65	0.092	0.039	0.140	0.108
Copper, filtered	mg/l	1.3*	0.65		<0.025	<0.025	<0.025
Lead	mg/l	0.015*	0.0075	1.02 (3)	0.312 (3)	0.246(3)	1.17(3)
Lead, filtered	mg/l	0.015*	0.0075		<0.003	<0.003	<0.003
Mercury	mg/l	0.002	0.002	<0.0002	<0.0002	0.0015	0.0003
Mercury, filtered	mg/l	0.002	0.002		<0.0002	0.0005	<0.0002
Nickel	mg/l	0.1	0.1	0.254 (3)	0.075	0.980(3)	0.492(3)
Nickel, filtered	mg/l	0.1	0.1		<0.040	0.083	0.073
Selenium	mg/l	0.05	0.05	<0.005	<0.005	<0.005	<0.005
Selenium, filtered	mg/l	0.05	0.05		<0.005	<0.005	<0.005
Silver	mg/l	-	0.05	<0.010	<0.010	<0.010	<0.010
Silver, filtered	mg/l	-	0.05		<0.010	<0.010	<0.010
Thallium	mg/l	0.002	-	0.07 (1)	0.008 (1)	0.011(1)	0.014(1)
Thallium, filtered	mg/l	0.002	-		0.003 (1)	0.005(1)	0.003(1)
Zinc	mg/l	-	5.0	0.567	0.177	0.376	0.759
Zinc, filtered	mg/l	-	5.0		0.028	0.151	0.159

Woodward-Clyde

**Table 1-5: Metals Results of
Historical Groundwater Sampling Events
NL/Taracorp Superfund Site**

Parameter	Unit	MCLs (mg/L)	ILLINOIS CLASS I STANDARDS (mg/L)	MW-108D						
				JULY 1992	OCTOBER 1992	MARCH 1993	SEPTEMBER 1993	APRIL 1994	JULY 1994	OCTOBER 1994
Antimony	mg/l	0.006	-	<0.008	0.022 (1)	<0.060	<0.050	<0.006	<0.006	<0.006
Antimony, filtered	mg/l	0.006	-					<0.006	<0.006	<0.006
Arsenic	mg/l	0.05	0.05	<0.003	0.018	<0.003	<0.010	<0.010	<0.010	<0.010
Arsenic, filtered	mg/l	0.05	0.05					<0.010	<0.010	<0.010
Beryllium	mg/l	0.004	-	<0.0006	0.00202	<0.0006	<0.005	<0.004	<0.004	<0.004
Beryllium, filtered	mg/l	0.004	-					<0.004	<0.004	<0.004
Cadmium	mg/l	0.005	0.005	8.5 (3)	9.6 (3)	1.9 (3)	4.51 (3)	5.41 (3)	10.3 (3)	11.6 (3)
Cadmium, filtered	mg/l	0.005	0.005					5.08 (3)	9.45 (3)	10.8 (3)
Chromium	mg/l	0.1	0.1	0.006	0.073 (1)	0.022	<0.010	<0.010	0.111 (3)	<0.010
Chromium, filtered	mg/l	0.1	0.1					<0.010	0.014	<0.010
Copper	mg/l	1.3*	0.65	<0.014	0.045	<0.014	<0.025	<0.025	0.053	<0.025
Copper, filtered	mg/l	1.3*	0.65					<0.025	<0.025	<0.025
Lead	mg/l	0.015*	0.0075	0.023 (3)	0.14 (3)	0.0043	<0.003	<0.003	0.102 (3)	0.017
Lead, filtered	mg/l	0.015*	0.0075					<0.003	0.004	<0.003
Mercury	mg/l	0.002	0.002	<0.0002	0.0002	<0.0002	<0.0002	<0.0002	0.0009	<0.0002
Mercury, filtered	mg/l	0.002	0.002					<0.0002	0.0012	<0.0002
Nickel	mg/l	0.1	0.1	0.46 (3)	0.63 (3)	0.17 (3)	0.313 (3)	0.435 (3)	0.793 (3)	0.849 (3)
Nickel, filtered	mg/l	0.1	0.1					0.396 (3)	0.564 (3)	0.818 (3)
Selenium	mg/l	0.05	0.05	<0.003	<0.003	<0.015	<0.005	<0.005	<0.005	<0.005
Selenium, filtered	mg/l	0.05	0.05					<0.005	<0.005	<0.005
Silver	mg/l	-	0.05	<0.0004	<0.009	<0.009	<0.010	0.012	<0.010	<0.010
Silver, filtered	mg/l	-	0.05					<0.010	<0.010	<0.010
Thallium	mg/l	0.002	-	0.046 (1)	0.046 (1)	0.028 (1)	<0.050	0.045 (1)	0.094 (1)	0.114 (1)
Thallium, filtered	mg/l	0.002	-					0.043 (1)	0.101 (1)	0.136 (1)
Zinc	mg/l	-	5.0	28 (2)	34 (2)	7.6 (2)	18.1 (2)	23.1 (2)	38.4 (2)	44.9 (2)
Zinc, filtered	mg/l	-	5.0					21.5 (2)	31.3 (2)	42.4 (2)

Woodward-Clyde

**Table 1-5: Metals Results of
Historical Groundwater Sampling Events
NL/Taracorp Superfund Site**

Parameter	Unit	MCLs (mg/L)	ILLINOIS CLASS I STANDARDS (mg/L)	MW-108D QC FIELD DUPLICATE			
				JULY 1992	OCTOBER 1992	MARCH 1993	SEPTEMBER 1993
Antimony	mg/l	0.006	—	<0.002	<0.011	<0.060	<0.050
Antimony, filtered	mg/l	0.006	—				
Arsenic	mg/l	0.05	0.05	<0.003	0.023	<0.003	<0.010
Arsenic, filtered	mg/l	0.05	0.05				
Beryllium	mg/l	0.004	—	0.0007	0.00188	<0.0006	<0.005
Beryllium, filtered	mg/l	0.004	—				
Cadmium	mg/l	0.005	0.005	9.0 (3)	9.2 (3)	1.9 (3)	4.42 (3)
Cadmium, filtered	mg/l	0.005	0.005				
Chromium	mg/l	0.1	0.1	0.006	0.084 J	0.029	<0.010
Chromium, filtered	mg/l	0.1	0.1				
Copper	mg/l	1.3*	0.65	<0.014	0.044	<0.014	<0.025
Copper, filtered	mg/l	1.3*	0.65				
Lead	mg/l	0.015*	0.0075	0.026 (3)	0.15 (3)	0.0038	<0.003
Lead, filtered	mg/l	0.015*	0.0075				
Mercury	mg/l	0.002	0.002	<0.0002	0.0002	<0.0002	<0.0002
Mercury, filtered	mg/l	0.002	0.002				
Nickel	mg/l	0.1	0.1	0.47 (3)	0.64 (3)	0.18 (3)	0.302 (3)
Nickel, filtered	mg/l	0.1	0.1				
Selenium	mg/l	0.05	0.05	<0.003	<0.003	<0.015	<0.005
Selenium, filtered	mg/l	0.05	0.05				
Silver	mg/l	—	0.05	<0.0004	<0.009	<0.009	<0.010
Silver, filtered	mg/l	—	0.05				
Thallium	mg/l	0.002	—	0.048 (1)	0.051 (1)	0.029 (1)	0.05 (1)
Thallium, filtered	mg/l	0.002	—				
Zinc	mg/l	—	5.0	28 (2)	34 (2)	7.7 (2)	17.9 (2)
Zinc, filtered	mg/l	—	5.0				

Woodward-Clyde

**Table 1-5: Metals Results of
Historical Groundwater Sampling Events
NL/Taracorp Superfund Site**

Parameter	Unit	MCLs (mg/l.)	ILLINOIS CLASS I STANDARDS (mg/l.)	MW-109						
				JULY 1992	OCTOBER 1992	MARCH 1993	SEPTEMBER 1993	APRIL 1994	JULY 1994	OCTOBER 1994
Antimony	mg/l	0.006	-	<0.002	<0.011	<0.060	<0.050	<0.006	<0.006	<0.006
Antimony, filtered	mg/l	0.006	-							
Arsenic	mg/l	0.05	0.05	<0.003	<0.003	<0.003	<0.010	<0.010	<0.010	<0.010
Arsenic, filtered	mg/l	0.05	0.05							
Beryllium	mg/l	0.004	-	<0.0006	<0.0006	<0.0006	<0.005	<0.004	<0.004	<0.004
Beryllium, filtered	mg/l	0.004	-							
Cadmium	mg/l	0.005	0.005	0.0028	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Cadmium, filtered	mg/l	0.005	0.005							
Chromium	mg/l	0.1	0.1	<0.002	<0.013	<0.013	<0.010	<0.010	<0.010	<0.010
Chromium, filtered	mg/l	0.1	0.1							
Copper	mg/l	1.3*	0.65	<0.014	<0.014	<0.014	<0.025	<0.025	<0.025	0.027
Copper, filtered	mg/l	1.3*	0.65							
Lead	mg/l	0.015*	0.0075	0.0046	0.019 (3)	<0.002	<0.003	<0.003	<0.003	<0.003
Lead, filtered	mg/l	0.015*	0.0075							
Mercury	mg/l	0.002	0.002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Mercury, filtered	mg/l	0.002	0.002							
Nickel	mg/l	0.1	0.1	<0.023	<0.023	<0.023	0.059	<0.040	<0.040	<0.040
Nickel, filtered	mg/l	0.1	0.1							
Selenium	mg/l	0.05	0.05	<0.003	<0.003	<0.003	<0.005	<0.005	<0.005	<0.005
Selenium, filtered	mg/l	0.05	0.05							
Silver	mg/l	-	0.05	<0.0004	<0.009	<0.009	<0.010	<0.010	<0.010	<0.010
Silver, filtered	mg/l	-	0.05							
Thallium	mg/l	0.002	-	<0.002	<0.002	<0.002	<0.050	<0.002	<0.002	<0.002
Thallium, filtered	mg/l	0.002	-							
Zinc	mg/l	-	5.0	0.057	0.077 J	<0.020	<0.020	<0.020	<0.020	<0.020
Zinc, filtered	mg/l	-	5.0							

Woodward-Clyde

**Table I-5: Metals Results of
Historical Groundwater Sampling Events
NL/Paracorp Superfund Site**

Parameter	Unit	MCLs (mg/L)	ILLINOIS CLASS I STANDARDS (mg/L)	MW-109-92						
				JULY 1992	OCTOBER 1992	MARCH 1993	SEPTEMBER 1993	APRIL 1994	JULY 1994	OCTOBER 1994
Antimony	mg/l	0.006	-	<0.002	<0.011	<0.060	<0.050	<0.006	<0.006	<0.006
Antimony, filtered	mg/l	0.006	-							
Arsenic	mg/l	0.05	0.05	<0.003	<0.003	<0.003	<0.010	<0.010	<0.010	<0.010
Arsenic, filtered	mg/l	0.05	0.05							
Beryllium	mg/l	0.004	-	<0.0006	<0.0006	<0.0006	<0.0005	<0.0004	<0.0004	<0.0004
Beryllium, filtered	mg/l	0.004	-							
Cadmium	mg/l	0.005	0.005	0.0018	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Cadmium, filtered	mg/l	0.005	0.005							
Chromium	mg/l	0.1	0.1	0.003	0.021 U	<0.013	<0.010	0.011	<0.010	<0.010
Chromium, filtered	mg/l	0.1	0.1							
Copper	mg/l	1.3*	0.65	<0.014	<0.014	<0.014	<0.025	<0.025	<0.025	0.154
Copper, filtered	mg/l	1.3*	0.65							
Lead	mg/l	0.015*	0.0075	0.018 (3)	0.0038	<0.002	<0.003	<0.003	<0.003	<0.003
Lead, filtered	mg/l	0.015*	0.0075							
Mercury	mg/l	0.002	0.002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Mercury, filtered	mg/l	0.002	0.002							
Nickel	mg/l	0.1	0.1	<0.023	<0.023	<0.023	<0.040	<0.040	<0.040	<0.040
Nickel, filtered	mg/l	0.1	0.1							
Selenium	mg/l	0.05	0.05	<0.003	<0.003	<0.003	<0.005	<0.005	<0.005	<0.005
Selenium, filtered	mg/l	0.05	0.05							
Silver	mg/l	-	0.05	<0.0004	<0.009	<0.009	<0.010	<0.010	<0.010	<0.010
Silver, filtered	mg/l	-	0.05							
Thallium	mg/l	0.002	-	<0.002	<0.002	<0.002	<0.050	<0.002	<0.002	<0.002
Thallium, filtered	mg/l	0.002	-							
Zinc	mg/l	-	5.0	0.081	0.057 J	<0.020	<0.020	<0.020	<0.020	0.000
Zinc, filtered	mg/l	-	5.0							

Woodward-Clyde

**Table 1-5: Metals Results of
Historical Groundwater Sampling Events
NI/Taracorp Superfund Site**

Parameter	Unit	MCLs (mg/L)	ILLINOIS CLASS I STANDARDS (mg/L)	MW-110							MW-110 QC FILTER DUPLICATION JULY 1994
				JULY 1992	OCTOBER 1992	MARCH 1993	SEPTEMBER 1993	APRIL 1994	JULY 1994	OCTOBER 1994	
Antimony	mg/l	0.006	-	<0.002	<0.011	<0.060	<0.050	<0.006	<0.006	<0.006	<0.006
Antimony, filtered	mg/l	0.006	-								
Arsenic	mg/l	0.05	0.05	<0.003	<0.003	<0.003	<0.010	<0.010	<0.010	<0.010	<0.010
Arsenic, filtered	mg/l	0.05	0.05								
Beryllium	mg/l	0.004	-	<0.0006	<0.0006	<0.0006	<0.005	<0.004	<0.004	<0.004	<0.004
Beryllium, filtered	mg/l	0.004	-								
Cadmium	mg/l	0.005	0.005	0.0013	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Cadmium, filtered	mg/l	0.005	0.005								
Chromium	mg/l	0.1	0.1	<0.002	<0.013	<0.013	<0.010	<0.010	<0.010	<0.010	<0.010
Chromium, filtered	mg/l	0.1	0.1								
Copper	mg/l	1.3*	0.65	<0.014	<0.014	<0.014	<0.025	<0.025	0.043	0.084	0.070
Copper, filtered	mg/l	1.3*	0.65								
Lead	mg/l	0.015*	0.0075	0.0042	0.017 (3)	<0.002	<0.003	<0.003	<0.003	<0.003	<0.003
Lead, filtered	mg/l	0.015*	0.0075								
Mercury	mg/l	0.002	0.002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Mercury, filtered	mg/l	0.002	0.002								
Nickel	mg/l	0.1	0.1	<0.023	0.033	<0.023	<0.040	<0.040	<0.040	<0.040	<0.040
Nickel, filtered	mg/l	0.1	0.1								
Selenium	mg/l	0.05	0.05	<0.003	<0.003	<0.003	<0.005	<0.005	<0.005	<0.005	<0.005
Selenium, filtered	mg/l	0.05	0.05								
Silver	mg/l	-	0.05	<0.0004	<0.009	<0.009	<0.010	<0.010	<0.010	<0.010	<0.010
Silver, filtered	mg/l	-	0.05								
Thallium	mg/l	0.002	-	<0.002	<0.002	<0.002	<0.050	<0.002	<0.002	<0.002	<0.002
Thallium, filtered	mg/l	0.002	-								
Zinc	mg/l	-	5.0	0.043	0.078	<0.020	<0.020	<0.020	0.092	0.051	0.081
Zinc, filtered	mg/l	-	5.0								

Woodward-Clyde

**Table 1-5: Metals Results of
Historical Groundwater Sampling Events
NL/Taracorp Superfund Site**

Parameter	Unit	MCLs (mg/l.)	ILLINOIS CLASS I STANDARDS (mg/l.)	MW-111-92						
				JULY 1992	OCTOBER 1992	MARCH 1993	SEPTEMBER 1993	APRIL 1994	JULY 1994	OCTOBER 1994
Antimony	mg/l	0.006	—	<0.002	<0.011	<0.060	<0.050	<0.006	<0.006	<0.006
Antimony, filtered	mg/l	0.006	—							
Arsenic	mg/l	0.05	0.05	0.0046	0.0037	<0.003	<0.010	<0.010	<0.010	<0.010
Arsenic, filtered	mg/l	0.05	0.05							
Beryllium	mg/l	0.004	—	<0.0006	<0.0006	<0.0006	<0.005	<0.004	<0.004	<0.004
Beryllium, filtered	mg/l	0.004	—							
Cadmium	mg/l	0.005	0.005	<0.0003	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Cadmium, filtered	mg/l	0.005	0.005							
Chromium	mg/l	0.1	0.1	<0.002	0.024 U	<0.013	<0.010	<0.010	0.015	<0.010
Chromium, filtered	mg/l	0.1	0.1							
Copper	mg/l	1.3*	0.65	<0.014	<0.014	<0.014	<0.025	<0.025	0.029	<0.025
Copper, filtered	mg/l	1.3*	0.65							
Lead	mg/l	0.015*	0.0075	0.003	0.009 (2)	<0.002	<0.003	<0.003	<0.003 UJ	<0.003
Lead, filtered	mg/l	0.015*	0.0075							
Mercury	mg/l	0.002	0.002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Mercury, filtered	mg/l	0.002	0.002							
Nickel	mg/l	0.1	0.1	<0.023	<0.023	<0.023	<0.040	<0.040	<0.040	<0.040
Nickel, filtered	mg/l	0.1	0.1							
Selenium	mg/l	0.05	0.05	<0.003	<0.003	<0.003	<0.005	<0.005	<0.005 UJ	<0.005
Selenium, filtered	mg/l	0.05	0.05							
Silver	mg/l	—	0.05	<0.0004	<0.009	<0.009	<0.010	<0.010	<0.010	<0.010
Silver, filtered	mg/l	—	0.05							
Thallium	mg/l	0.002	—	<0.002	<0.002	<0.002	<0.050	<0.002	<0.002	<0.002
Thallium, filtered	mg/l	0.002	—							
Zinc	mg/l	—	5.0	0.043	0.073	<0.020	<0.020	<0.020	0.084	<0.020
Zinc, filtered	mg/l	—	5.0							

Woodward-Clyde

**Table 1-5: Metals Results of
Historical Groundwater Sampling Events
NI-/Paracorp Superfund Site**

Parameter	Unit	MCLs (mg/l.)	ILLINOIS CLASS I STANDARDS (mg/l.)	MW-111-92 QC FIELD DUPLICATE					
				JULY 1992	OCTOBER 1992	MARCH 1993	SEPTEMBER 1993	APRIL 1994	OCTOBER 1994
Antimony	mg/l	0.006	-	<0.002	<0.011	<0.060	<0.050	<0.006	<0.006
Antimony, filtered	mg/l	0.006	-						
Arsenic	mg/l	0.05	0.05	0.004	<0.003	<0.003	<0.010	<0.010	<0.010
Arsenic, filtered	mg/l	0.05	0.05						
Beryllium	mg/l	0.004	-	<0.0006	<0.0006	<0.0006	<0.005	<0.004	<0.004
Beryllium, filtered	mg/l	0.004	-						
Cadmium	mg/l	0.005	0.005	0.0004	<0.005	<0.005	<0.005	<0.005	<0.005
Cadmium, filtered	mg/l	0.005	0.005						
Chromium	mg/l	0.1	0.1	<0.002	0.027 U	<0.013	<0.010	<0.010	<0.010
Chromium, filtered	mg/l	0.1	0.1						
Copper	mg/l	1.3*	0.65	<0.014	<0.014	<0.014	<0.025	<0.025	<0.025
Copper, filtered	mg/l	1.3*	0.65						
Lead	mg/l	0.015*	0.0075	0.0094 (2)	0.0072	<0.002	<0.003	<0.003	<0.003
Lead, filtered	mg/l	0.015*	0.0075						
Mercury	mg/l	0.002	0.002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Mercury, filtered	mg/l	0.002	0.002						
Nickel	mg/l	0.1	0.1	<0.023	<0.023	<0.023	<0.040	<0.040	<0.040
Nickel, filtered	mg/l	0.1	0.1						
Selenium	mg/l	0.05	0.05	<0.003	<0.003	<0.003	<0.005	<0.005	<0.005
Selenium, filtered	mg/l	0.05	0.05						
Silver	mg/l	-	0.05	<0.0004	<0.009	<0.009	<0.010	<0.010	<0.010
Silver, filtered	mg/l	-	0.05						
Thallium	mg/l	0.002	-	<0.002	<0.002	<0.002	<0.050	<0.002	<0.002
Thallium, filtered	mg/l	0.002	-						
Zinc	mg/l	-	5.0	0.059	0.068	<0.020	<0.020	<0.020	<0.020
Zinc, filtered	mg/l	-	5.0						

Woodward-Clyde

**Table 1-5: Metals Results of
Historical Groundwater Sampling Events
NL/Taracorp Superfund Site**

Parameter	Unit	MCLs (mg/L)	ILLINOIS CLASS I STANDARDS (mg/L)	MW-112 QC RINSTATE BLANK							MW-117 QC RINSTATE APRIL 1994
				JULY 1992	OCTOBER 1992	MARCH 1993	SEPTEMBER 1993	APRIL 1994	JULY 1994	OCTOBER 1994	
Antimony	mg/l	0.006	-	<0.002	<0.011	<0.060	<0.050	<0.006	<0.006	<0.006	<0.006
Antimony, filtered	mg/l	0.006	-								
Arsenic	mg/l	0.05	0.05	0.0032	<0.003	<0.003	<0.010	<0.010	<0.010	<0.010	<0.010
Arsenic, filtered	mg/l	0.05	0.05								
Beryllium	mg/l	0.004	-	<0.0006	<0.0006	<0.0006	<0.005	<0.004	<0.004	<0.004	<0.004
Beryllium, filtered	mg/l	0.004	-								
Cadmium	mg/l	0.005	0.005	<0.0003	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Cadmium, filtered	mg/l	0.005	0.005								
Chromium	mg/l	0.1	0.1	<0.002	<0.013	<0.013	<0.010	<0.010	<0.010	<0.010	<0.010
Chromium, filtered	mg/l	0.1	0.1								
Copper	mg/l	1.3*	0.65	<0.014	<0.014	<0.014	<0.025	<0.025	<0.025	<0.025	<0.025
Copper, filtered	mg/l	1.3*	0.65								
Lead	mg/l	0.015*	0.0075	<0.002	<0.002	<0.002	<0.003	<0.003	<0.003	<0.003	<0.003
Lead, filtered	mg/l	0.015*	0.0075								
Mercury	mg/l	0.002	0.002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Mercury, filtered	mg/l	0.002	0.002								
Nickel	mg/l	0.1	0.1	<0.023	<0.023	<0.023	<0.040	<0.040	<0.040	<0.040	<0.040
Nickel, filtered	mg/l	0.1	0.1								
Selenium	mg/l	0.05	0.05	<0.003	<0.003	<0.003	<0.005	<0.005	<0.005	<0.005	<0.005
Selenium, filtered	mg/l	0.05	0.05								
Silver	mg/l	-	0.05	<0.0004	<0.009	<0.009	<0.010	<0.010	<0.010	<0.010	<0.010
Silver, filtered	mg/l	-	0.05								
Thallium	mg/l	0.002	-	<0.002	<0.002	<0.002	<0.050	<0.002	<0.002	0.003 (1)	<0.002
Thallium, filtered	mg/l	0.002	-								
Zinc	mg/l	-	5.0	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020
Zinc, filtered	mg/l	-	5.0								

Woodward-Clyde

**Table 1-5: Metals Results of
Historical Groundwater Sampling Events
NL/Taracorp Superfund Site**

Notes:

- U – The compound was analyzed for but was not detected. The associated numerical value is attributed to contamination and is considered to be the sample quantitation limit.**
- J – The associated numerical value is an estimated quantity.**
- – Action Level that triggers treatment.**
- (1) – Sample concentration is above the MCL.**
- (2) – Sample concentration is above the Illinois Groundwater Quality Standard for a Class I Potable Resource.**
- (3) – Sample Concentration is above both the MCL and the Illinois Class I Groundwater Quality Standard
Illinois Class I Groundwater Quality Standard.**